The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 26 CHICAGO December 17, 1921

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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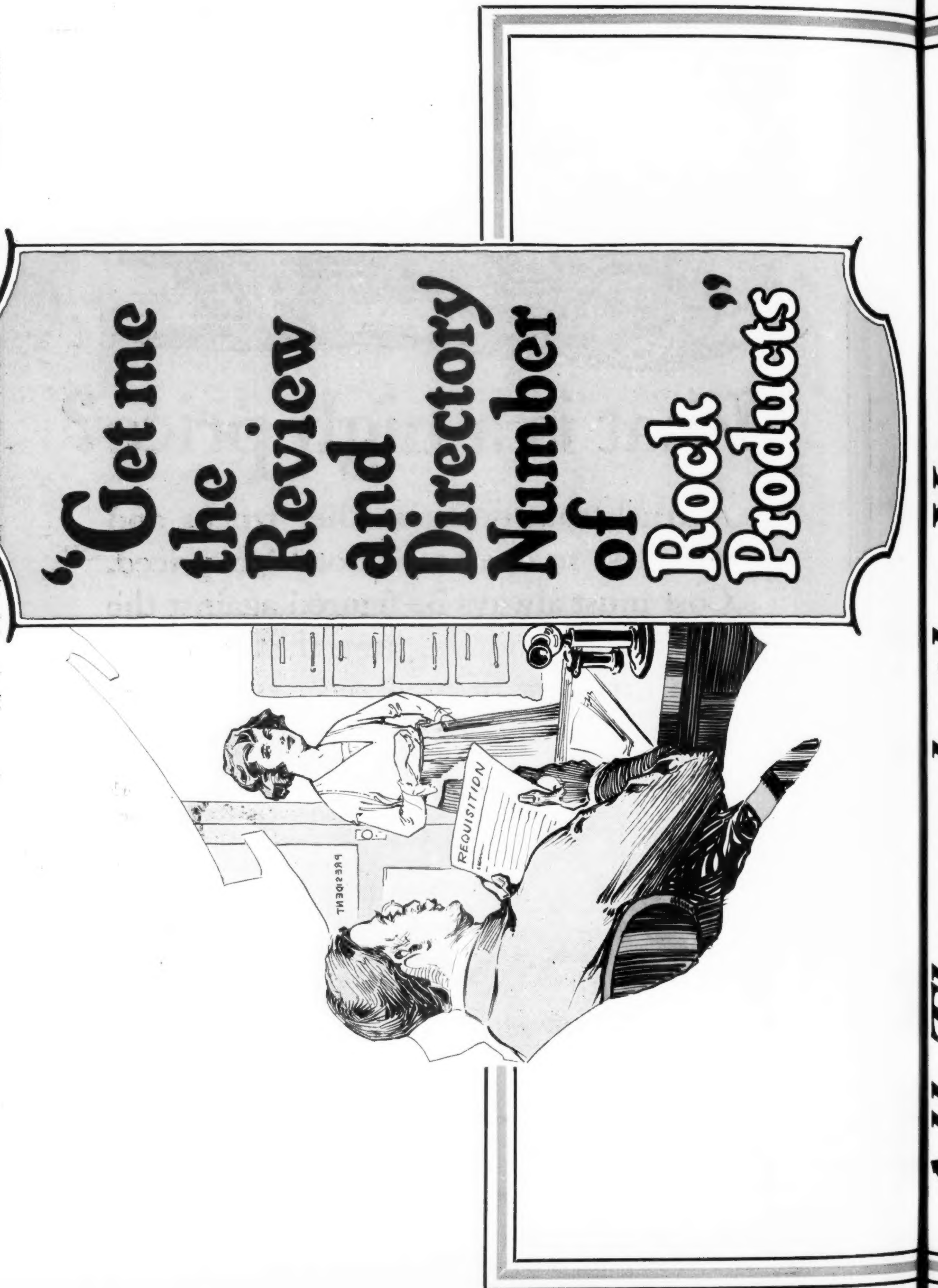
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REQUISITION

All Through the Year

Rock Products is the only journal with a paid circulation in the Rock Products Industry, and the fact that our subscribers pay every year for the privilege of reading this business journal demonstrates a reader-interest that necessarily passes on to the advertising section.

HOW many times do you suppose "Get me the Review and Directory Number of **Rock Products**" will be heard by stenographers during 1922?

Time after time, day after day, all through the year, this number will be in demand by some one of the executives, managers or superintendents of the plants that make up the Rock Products Industry.

Whenever any additional equipment or replacements are needed, these men will instinctively turn to the directory section of this number, knowing they will be accurately informed concerning the manufacturers who actually manufacture the products listed.

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Cement
Crushed Stone
Phosphate
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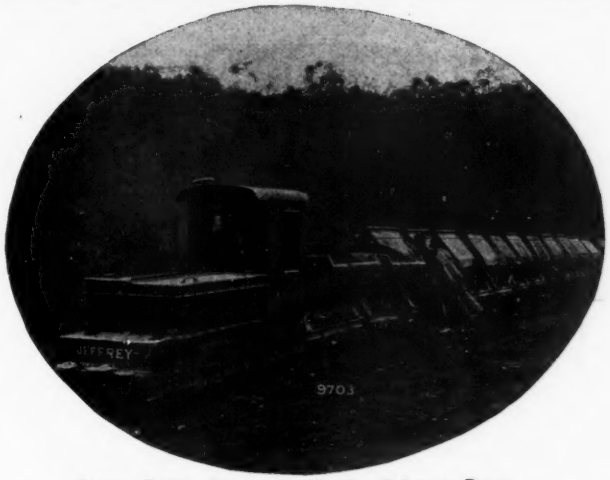
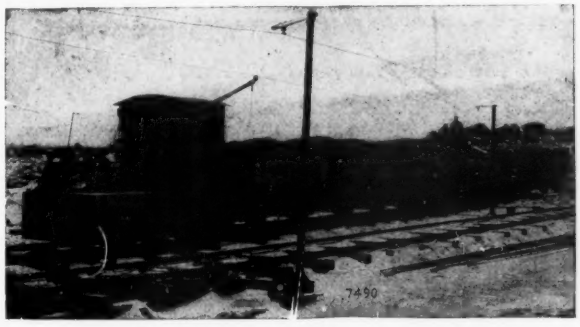


Storage Battery Locomotive Hauling Refuse to Dump



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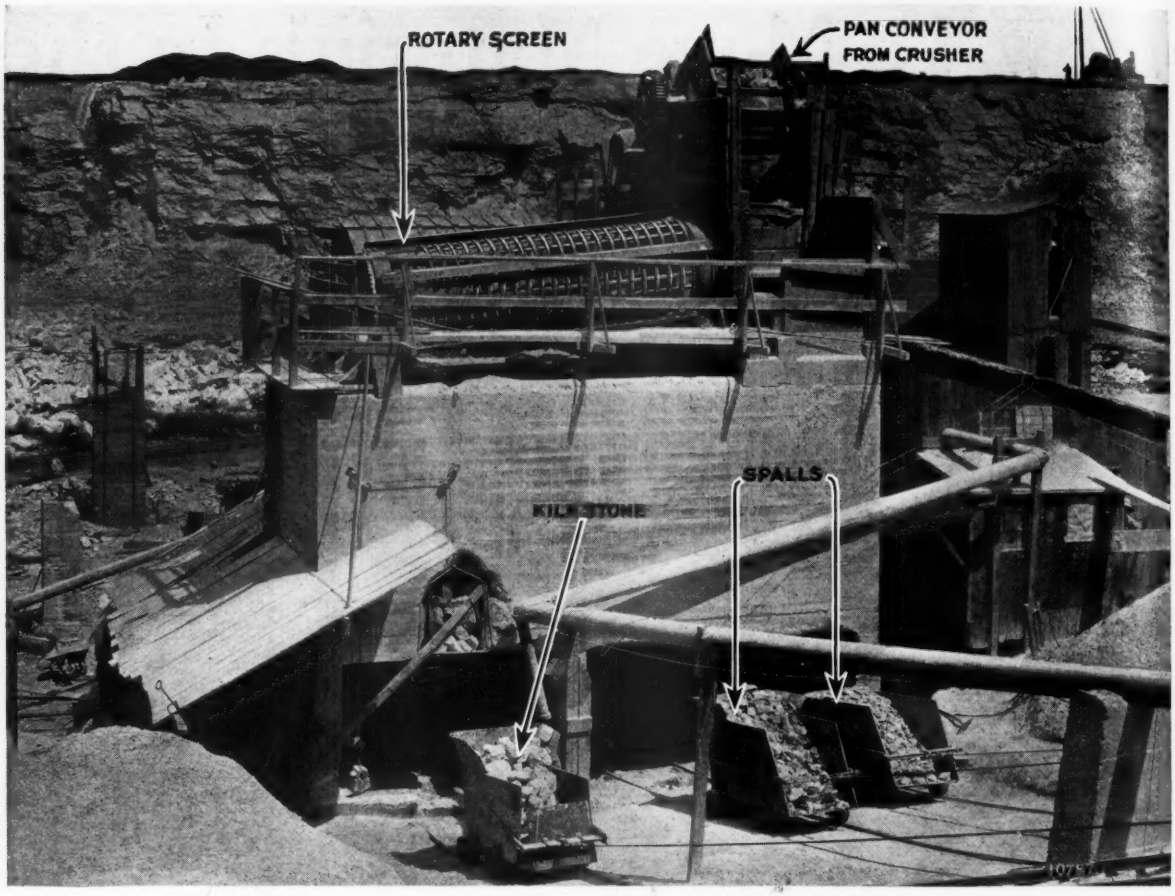

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ARE you taking all the spalls out of your kiln-stone mechanically? The cut above shows a plant which is turning out the two products shown, into skip cars. One is spall for the grinding plant. The other is kiln-stone, screened and cleaned. This means more lime, less fuel, larger lumps, and if you use a steam shovel and a jaw crusher set to 8", your core troubles practically disappear.

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SHOPE BULLETIN

VOL. I December 17, 1921 Number 8

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It has been done. Shope Concrete Brick are supreme in every territory where they are now manufactured, and they have attained this enviable position simply and purely on the merit of the product.

Shope Cream Rough Texture Face Brick used

The Shope Licensee has an absolute monopoly in his territory, and as practically every producer has waste screenings, slag, or sand and gravel to work with, they enjoy more than the usual profit.

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These licensees are all successful manufacturers

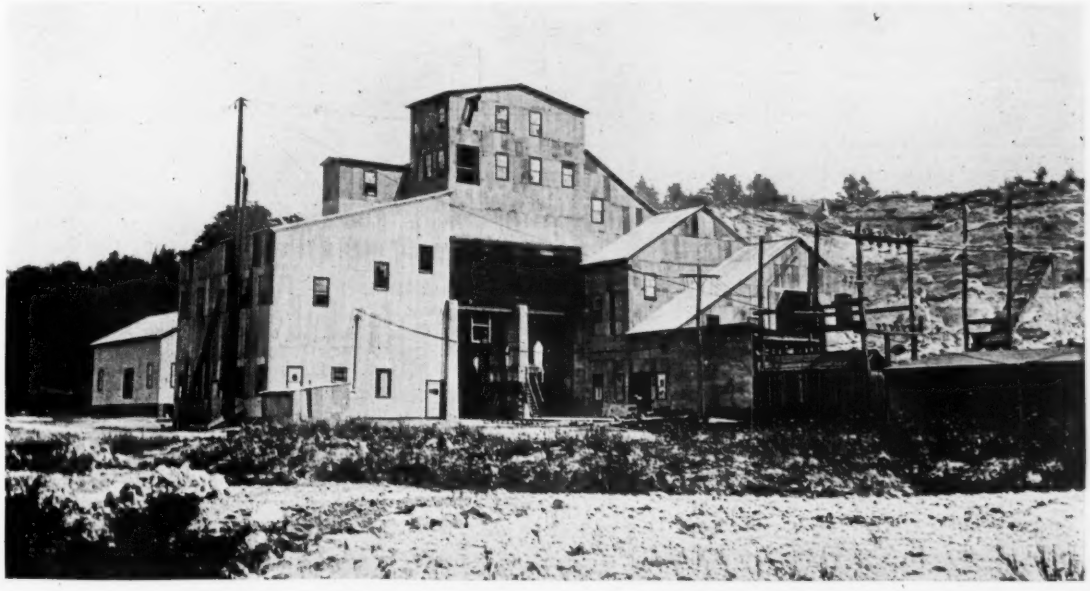
Rock Products

Vol. XXIV Chicago, December 17, 1921 No. 26

Modern New Jersey Limestone Plant

New Plant of the Limestone Products Corporation of America Starts Operation—Compartment Tube Mill a Feature

THERE has recently been placed in operation the first unit of the plant of the Limestone Products Corporation of America, Newton, N. J., consisting of a limestone crushing and pulverizing department. The plant is located at Lime Crest, near Newton, about 55 miles from New York, on the Lehigh and Hudson River Railroad, where the company controls a 99-year lease on 45 acres of fine white limestone. The material consists of a highly crystalline structure, practically a calcite, and from analyses made by several reputable chemists it shows from 96 per cent to 98 per cent calcium carbonate ($CaCO_3$), with practically no silica and a very low percentage of magnesia.



General view of plant of Limestone Products Corporation, Newton, N. J.

While the plant is of moderate size, several features have been incorporated in its erection which make it one of the most modern in the United States and probably the first pulverized limestone plant to utilize the compartment tube mill in pulverizing its product.

Quarry and Quarry Operation

The quarry opening is located on the side of a hill which is virtually a mountain of pure limestone in inexhaustible quantities. This natural formation is an asset in quarrying, as it allows a very high face and excellent drainage facilities, so that the stone carries a minimum amount of moisture at all times. As there is practically no overburden, stripping is entirely eliminated. The rock is drilled by a large well drill and the entire face blasted down at one time, supplying enough rock to last several months. At present the rock is loaded by hand into 2-ton side dump cars, but a steam shovel for loading will be installed in the near future. The cars run by gravity to a dumping tipple, directly over the railroad cars, into which the cement and furnace flux stone is dumped.

Crushing Plant

The cars also run by gravity to the crusher building, where they are dumped into a No. 10 Gates gyratory crusher, which has a capacity of 2000 tons per 10-hour day. This crusher is belted to a 150-hp. slip-ring type motor having three bearings and a unified base plate, located in a dust-proof motor room to insure long life of the motor and belts. A feature of the crusher location is that the receiving opening of the crusher is on a

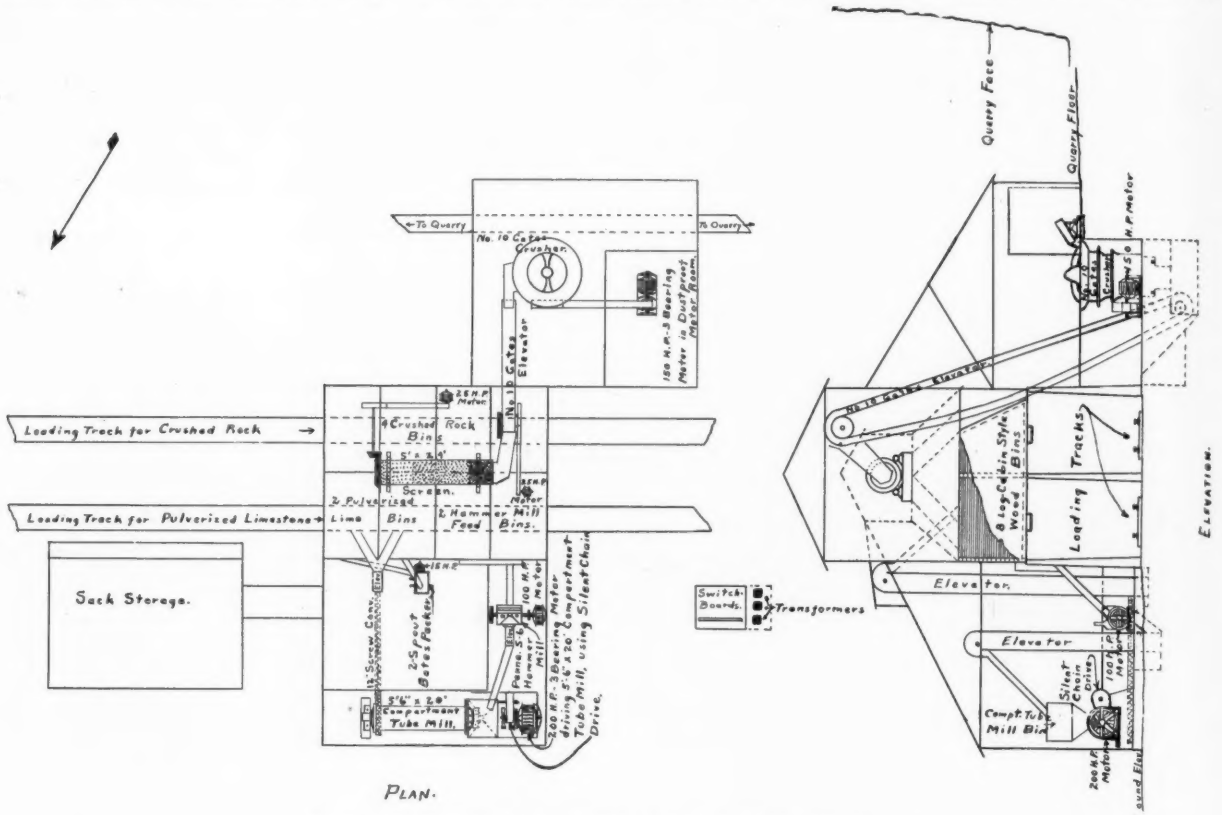
level with the quarry floor, thus eliminating all inclines.

This crusher receives the rock as quarried and in one operation reduces it to 3 in. and under; it is then discharged into a No. 10 bucket elevator. Next, it is elevated to the top of the bin house, where it discharges into a revolving screen, 5 ft. diameter by 14 ft. long, in which the rock is screened to the sizes the trade requires. This screen has quick removing screen plates so that the output can be quickly changed to fill all orders promptly.

From the screen, the proper sized and screened rock drops into four large

Dryer

When the moisture in the rock is considerable, the rock can be tapped directly out of the storage bins to a belt conveyor and conveyed to a small bin located ahead of a 5 ft. 6 in. x 40 ft. rotary dryer, the material being fed into the dryer by a table feeder. This dryer is operated by a 15 hp. motor and is set at an inclination of ¾ in. per foot. The rock in passing through the dryer is subjected to the heat coming in the opposite direction to the flow of material by which all traces of moisture are eliminated. The dryer is fired by coal. After passing through the



General arrangement of the crushing and pulverizing departments

crushed-rock bins, from which it can be spouted into cars, spotted directly underneath the bins, for shipment. These four bins, in conjunction with two pulverized bins and two hammer mill feed bins, making eight bins in all, constitutes the bin house. The bins are constructed of timber, log-cabin style, and are located above the railroad tracks to facilitate easy loading into the cars. The oversize from the screen is returned back to the crusher, while the screenings and any other size required is delivered into the two hammer mill bins, from which it is spouted and fed into a Pennsylvania hammer mill, direct-connected to a 100-hp. motor operating at 925 r.p.m. This mill reduces any nominal size rock to ½ in. and down.

dryer the rock drops into an elevator which delivers it to a bin located directly above and feeding the hammer mill.

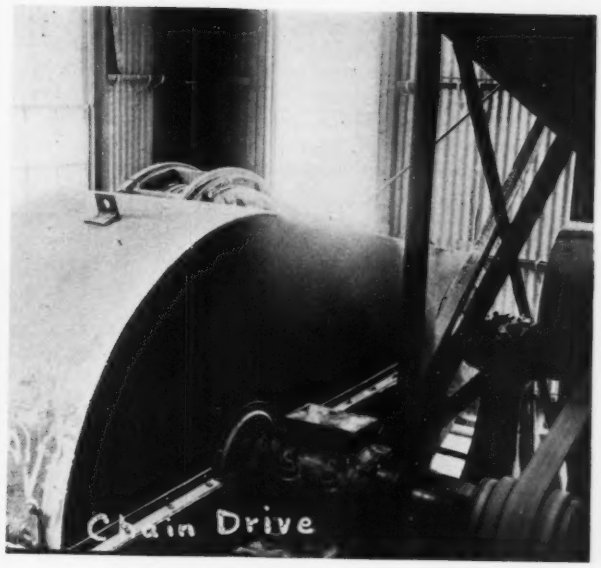
The product from the hammer mill is elevated and spouted into the compartment tube mill bin, from which it is fed by a specially designed feeder into the compartment tube mill, 5½ ft. in diameter by 20 ft. long, which is driven by gears, and they in turn by a 22-in. wide silent chain drive, connected to a 200-hp., three-bearing, unified base plate, slip-ring motor which operates the mill at 22 r.p.m.

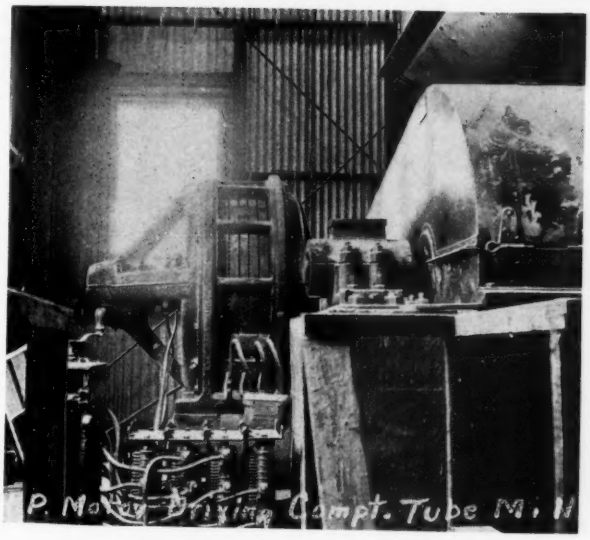
Compartment Tube Mill

The mill itself was an ordinary tube mill which has been rebuilt by placing a manganese steel partition about 4½ ft. from the feed end, followed by a blind partition, with lifter plates between, so that the material is again discharged into the second compartment near the axis of the mill. The first compartment is loaded to the center line with chrome steel balls 2½ in. down, while the grinding plates used in this end are of the corrugated type and made from steel similar to the Krupp formula. The second compartment or finishing end of the mill is loaded to the center line with ⅞ in. chilled iron balls, 1¼ in. balls being used for replacements. This compartment is lined with the corrugated type Fuller-Lehigh chilled iron grinding plates. This mill takes all the material from the hammer mill and in one operation grinds it to a very fine powder, so that about 80 per cent will pass through a sieve having 40,000 meshes per sq. in. Due to the fine product received from the hammer mill, this compartment mill was installed without an air separator, but the building was designed so it can be easily installed should an especially fine-ground product be required. The grinding room has been so designed that any additional number of mills can be installed by a slight addition to the building.

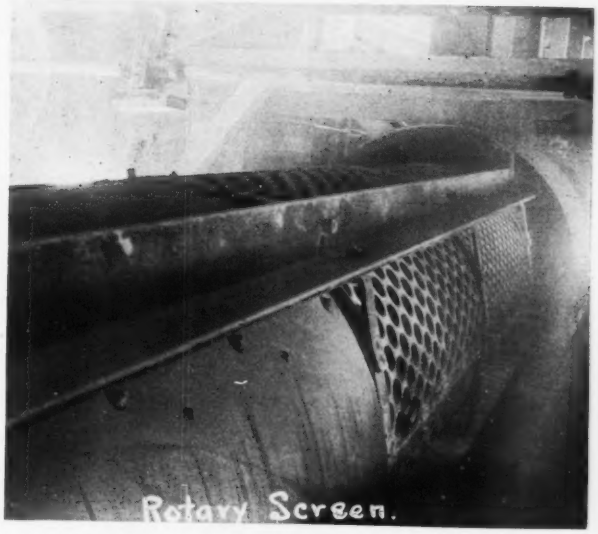
Packing and Loading

When the finely ground material leaves the mill it is elevated and conveyed into the two large pulverized limestone bins,

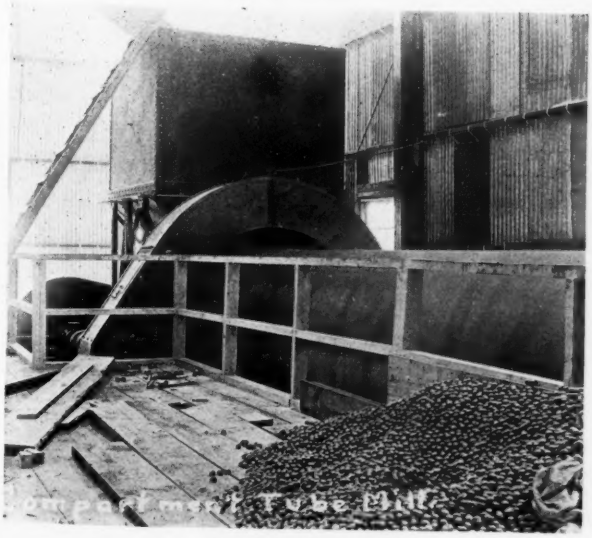




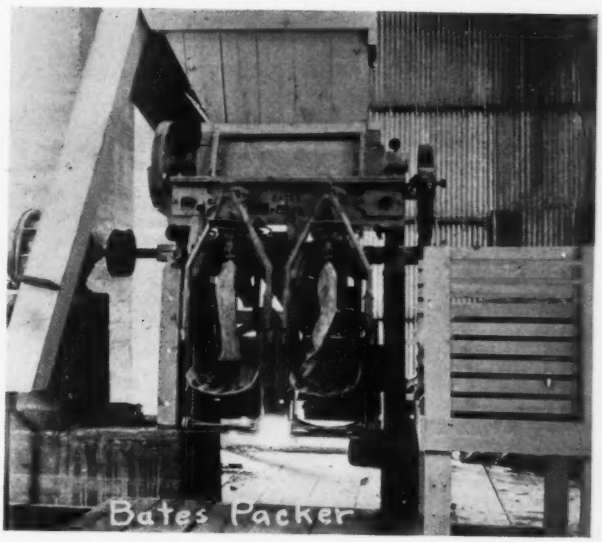
Motor and chain drive for tube mill



Rotary screen—Note heavy construction



Compartment tube mill



Bates two-spout valve bag-packer

from which it can be spouted into cars spotted underneath for bulk shipment, also into trucks and wagons for the local trade. It can also be spouted into a bin placed directly over and feeding into a two-spout automatic Bates packing machine which blows the material into sacks; when the correct amount or weight is in the bags, they automatically drop off the machine and down a slide into a box car. This machine insures the customer always receiving a neat package of correct weight in either cloth or paper sacks. This packer is direct connected to a 15-hp. motor and operates at 1200 r.p.m.

When ready for shipment the finely ground material is the commercial agricultural limestone recommended by the Bureau of Agriculture and so widely used by the farmers as a soil neutralizer. It is also used as a paint pigment to some extent and as a filler.

Power and Machinery

The plant further consists of a large sack storage connected by a runway to the packing room, a modern concrete electric sub-station where the electric current is transformed from a high tension to 440-volt, 60-cycle, five-phase, and a concrete distributing switchboard room, from which the various lines run direct to their respective motors. All the electric energy used at each motor is measured in this room, so that the plant can be operated along the most efficient lines from a power consumption standpoint. The electric current is furnished by the Newton Electric and Gas Co. The motors are heavy duty Western Electric cement plant type.

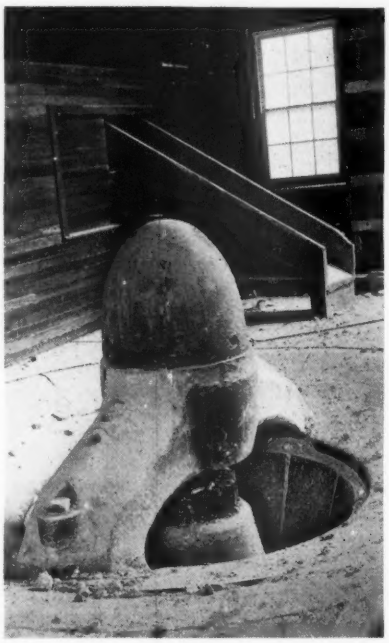
The compartment tube mill was rebuilt and extra material furnished by the Bethlehem Foundry & Machine Co., Bethlehem, Pa.; the elevating and conveying equipment by the Webster Manufacturing Co., Chicago, Ill.; the No. 10 Gates crusher, Gates elevator and Gates screen by the Allis-Chalmers Co., and the hammer mill by the Pennsylvania Crusher and Pulverizer Co., Philadelphia, Pa.

Plans have been formulated for the erection of the second unit, to consist of a chemical lime plant complete, using rotary kilns, a hydrated lime plant and a large battery of concrete silo storages, all of which will probably be constructed next year.

Views of the quarry—Natural formation allows a high face and excellent drainage facilities

Construction

The entire plant, with the exception of the storage bins, is constructed of concrete, structural and corrugated iron, making it practically fireproof. The steel buildings were fabricated and completely erected by the Belmont Iron Works, Philadelphia, Pa.



No. 10 gyratory crusher

Personnel

Directly after incorporating, the company secured as a stockholder Howard H. Leh, general superintendent of the Phoenix Cement Co., Nazareth, Pa., who became its consulting engineer and designed the entire plant. The construction was supervised by John McFadden, the company's plant manager, who had previously erected several crushing plants.

The officers are Edward S. Bixler, president; E. Merriam Dutcher and William S. Marrow, vice-presidents, Newton, N. J., and William E. Horne, secretary and treasurer, Easton, Pa. The sales manager is E. Mayer, who maintains a sales office at 26 Cortlandt street, New York City.

Cuban Sugar Growers Using Lime and Gypsum

AS THE RESULT of experiments with ground limestone and gypsum by the Cuban Agricultural Experiment Station, it has been found that the fertilizing action of gypsum mixed with waste matter and ashes has been remarkable.

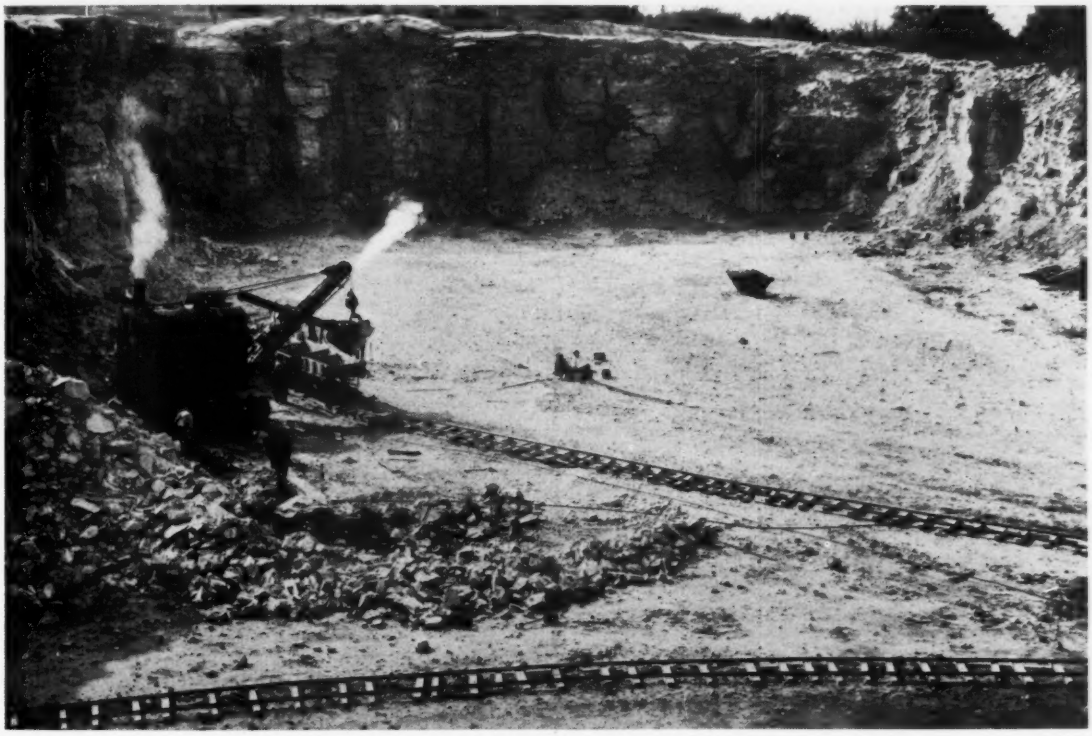
The increase in crop when employing gypsum is evident when it is considered that one increase in yield amounted to 83,952 arrobas (an arroba equals 25.4 lbs.), valued at $6,189.04, or 5 per cent of the investment. The limestone gave a net gain of $613.24, or 571 per cent of the investment.

Economical Silica Sand Plant

Geauga Silica Sand Company, Geauga Lake, Ohio, Produces Steel Molding Sand—Has Excellent Quarry Deposit

FOR downright simplicity and economy in the operation and preparation of silica sand, the plant of the Geauga Silica Sand Co. is entitled to be in the front rank. The plant is located in the immediate vicinity of Geauga Lake, Ohio, a popular summer resort, where during the season the company has but little trouble in getting labor.

Geauga Lake's deposit of silica rock is of excellent character and compares favorably with the Illinois deposits. It is white and yellow in color and analyzes 98 per cent silicon and ¼ of 1 per cent iron. As the grain is very sharp and the rock is easily disintegrated, the sand is used entirely by steel foundries, although it also makes an excellent facing, core and glass sand when washed. The sand as it comes from the quarry is free from any binder or bond. It would also make an excellent fire or furnace sand for lining furnaces and ladles dipping molten metal.



The quarry at Geauga Lake—Note the clean and level quarry floor

Quarry Operation

The company has 85 acres of rock deposit, entirely of hillside formation. The present quarry has a face 45 ft. high and is being worked in a semi-rectangular shape of about 200 ft. x 400 ft. About 1½ ft. of overburden on this deposit consists mostly of soil, which is removed by hand. The drilling is all done by means of a well drill and Cordeau-Bickford is used for detonation. Blasts occur here every month when anywhere from two to three tons of dynamite are used for one shot. The quarry floor is unusually clean.

After the rock has been shot down it is loaded into 24-in. gage, 1½-cu. yd. side-dump cars by a 30-ton steam shovel with a dipper of ⅝ cu. yd. capacity. The company operates 27 cars of this type, thus ensuring a regular supply of stone to the mill. In this quarry a light shovel operates much more quickly and effectively than a heavy shovel. The haul to the foot of the incline of the crushing plant is practically all made by gravity, although a mule is used part of the distance.

Crushing Plant

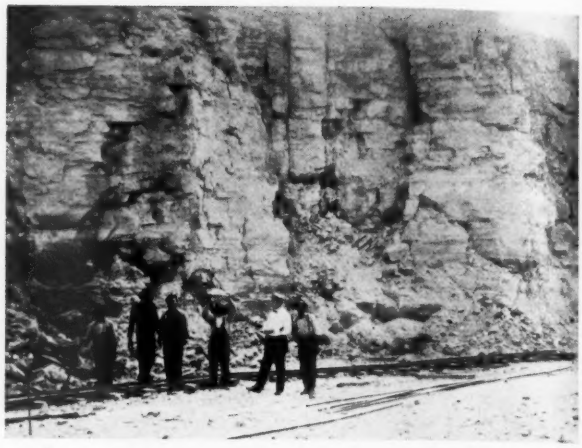
The cars are hauled up the incline by a steam hoist, and here one man operates both hoist and dumps and takes care of the cars. Below the hopper is a No. 5 gyratory crusher which reduces the rock to sand, or nearly sand. It is then reclaimed by a bucket elevator which transfers the crushed material to a hopper feeding a disintegrator or squirrel-cage mill, as it is commonly called. Here the final reduction process follows. The material falls on a belt conveyor directly underneath the disintegrator and is conveyed either to car or stock pile, which can be seen in one of the accompanying illustrations.

Power Plant

The power for the equipment and machinery is had from a 150-hp. boiler, which furnishes steam for the engine, air-compressor and derrick. The water supply for the boiler comes from the natural drainage from the quarry.

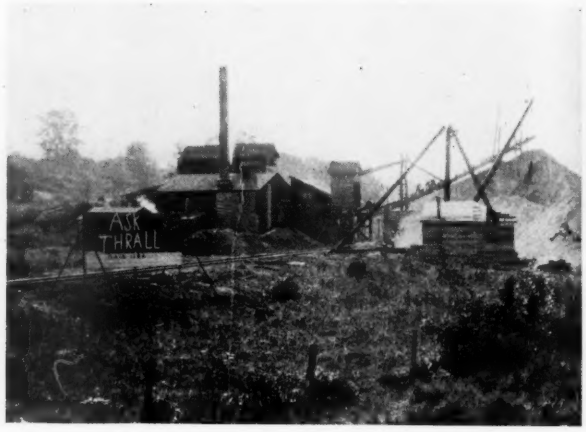
Due to the car shortage the company has acquired a stock pile of about 8000 tons of sand. To handle this a stiff-leg

Steam shovel loading silica rock



Character of rock—Note stratification

Crushing end of plant—Cars are drawn up incline to initial crusher by hoist



Loading end of plant. Note storage pile and derrick and clamshell bucket for rehandling

derrick with a ¾ cu. yd. clamshell bucket is used.

Plans for Improvement

The company has in mind extensive improvements when conditions are somewhat more settled. The quarry is to be extended and a new shovel placed to load rock, the old one to be used for stripping purposes only. New cars of larger gage and capacity will then be acquired and the reliable mule replaced by a dinkey to make the return trip to the shovel.

Organization

The company is a member of the American Sand Association, of which F. R. Thrall is president. Most noteworthy is the good will maintained between executives and employes, for such spirit always raises the efficiency of any plant.

Dr. A. P. Howland is president and manager of the company and F. R. Thrall secretary and treasurer. Dr. Howland practiced medicine before entering the silica sand business; but he has found it so fascinating that he has entirely forsaken his medical practice.

The Farmer and Rock Products

By R. L. Voorhees, Syracuse, N. Y.

WHAT WILL BE the future relations of the farmer to the fertilizer and lime manufacturer and dealer? Agriculture has changed tremendously since the war, and one of its greatest evidences is growing impatience with the present marketing system. As this injures the manufacturer or distributor at times, and often without careful analysis, he retaliates.

There is much to be said on the farmer's side: he is forced to buy his needs on a retail market and to sell his products on a wholesale market. This economic condition is in direct opposition to that in other industries. As long as it exists farmers will never be able to compete in any market for a net profit margin equal, relatively, to that obtained by other industries.

To overcome the difficulty the farmer is buying and selling collectively—a movement that has gone far enough to prove it is permanent. Within the past year or eighteen months farmers have entered the rock products field, a fact sufficient to warn owners and manufacturers that it is time to look into the situation.

What does this mean in the rock products field? Agricultural co-operation has come to stay, and is something to be reckoned with. Many times it will mean trouble and expense until an adjustment is worked out satisfactorily.

The United Fertilizer & Lime Co., with headquarters in Syracuse, N. Y., is an example. Established about six months ago, with Fred Kelly as president, this company began to dispose of its stock to farmers, making the company more or less of a co-operative concern with experienced commercial men at its head. One immediate result was that farm bureau managers and farmers themselves became suspicious of it and tremendous effort was brought to bear against the

campaign. It was slowed up for a while, but Mr. Kelly said only recently that the company was coming along well in its development.

There is another factor still to be met. In New York there is the Co-operative Grange League Federation Exchange, a vast farmers' buying organization. This company buys fertilizer and lime. The more it buys and sells, the better off it is—it can operate then on a low margin and still make money for its members. There is going to be an intensified antagonism between these two companies with the advantage pretty generally on the side of the farmers' company.

In Missouri, more than in any other state, developments are taking place that will undoubtedly affect the rock products dealers adversely, and through them the manufacturers. Furthermore, it will surely spread to other states. For instance:

Farmers in Perry County, Missouri, operating ten lime crushers, have crushed and spread more than 10,000 tons of limestone during the last six months of this year.

Another Missouri development is the New Jamestown Quarry Co., an incorporated organization of farmers controlled by a board of seven directors. At present it has about 60 stockholders. The plant is equipped with the latest machinery, and can supply crushed rock for road or other work and pulverized limestone for agricultural purposes.

Where it is impossible to secure a regular limestone plant, the co-operative buying associations are securing fertilizer and lime for farmer members and shipping it in carload lots. One notice reads: "Forty-four tons of lime were eagerly received; no demurrage, no storage or rehandling."

There is coming the shakeup of old-time distributive methods that will mean changes and adjustments on the part of manufacturers and dealers. How is it best to meet them?

White Silica Sand Plant

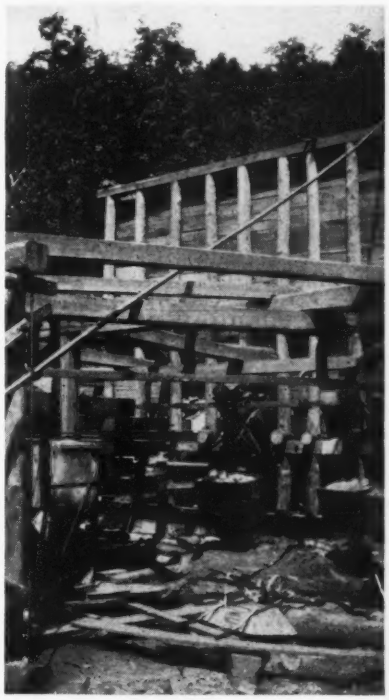
The Clinch Mountain Silica Sand Corporation, Richmond, Virginia, Has Completed Its Plant Near Mendota—Details of Equipment

SOME 2½ miles from Mendota, Va., a sand crushing plant controlled by the Clinch Mountain Silica Sand Corporation has been constructed on the Appalachia division of the Southern Railway. The plant has been under construction for more than a year and is now ready for operation. The sand rock deposit is of the finest quality in the county, analyzing 99.75 per cent pure silica with a very low percentage of iron.

The deposit owned by the company covers 150 acres lying along the top of the mountain about 4000 ft. in elevation. It is quarried and conveyed to the crushing plant at the railway by an aerial cable and bucket line constructed by A. Leschen & Sons, St. Louis. The plant equipment consists of an Austin gyratory crusher, a Williams pulverizer and a Tyler whip-tap separator screen.

General view of the plant showing the railroad siding

The aerial cableway and bucket line



Loading terminal at quarry 4000 ft. from base of mountain

The plant has a capacity of from 300 to 400 tons every 10 hours, and will turn out two grades of sand, the No. 1 white silica sand for glass manufacturing and the No. 2 for concrete, building and other purposes.

Including the quarry at the top of the mountain, the entire plant is electrically driven by water-power.

In addition to this plant the corporation has purchased three tube mills for the further grinding of the sand. This sand will be used in the manufacture of china and enamel ware, cleansing compounds and paint fillers. The company expects to have these mills in operation in the near future.

H. B. Christian is president of the Clinch Mountain Silica Sand Corporation, W. S. Forbes is vice-president and E. T. Scrutton is general manager, with offices at Mendota, Va.

Kansas Glass Sand Deposit

SOME of the finest glass sand has been found, it is reported, on a farm 30 miles west of Washington, Kans. The deposit is from 2 to 30 ft. deep and covers more than 30 acres. The sand is white and has a fine texture. Samples sent to a glass works in Belgium have been reported on as being of the finest quality.

Kansas university authorities have also passed favorably on samples of the deposit.

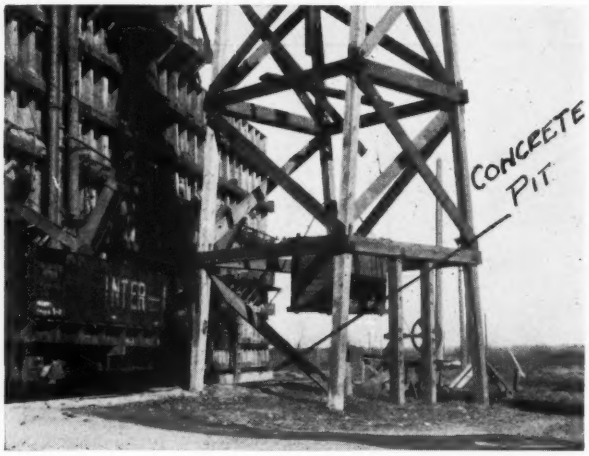
Hints and Helps for Superintendents

Keeping Loading Tracks Clean

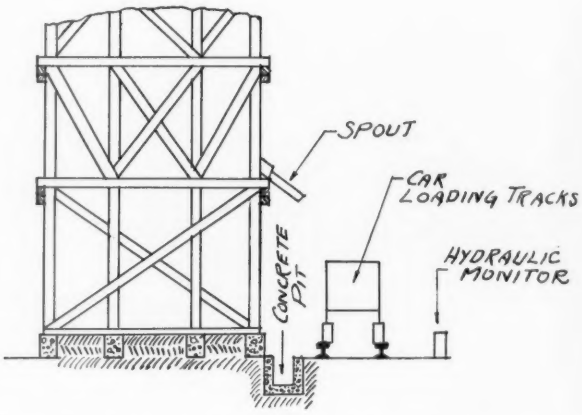
DERAILMENT OF CARS due to sand spilling over the loading tracks in sand and gravel operations is not an uncommon sight. Of course this is not the fault of the operator; it is due to sand leaking out of faulty cars. No matter how well a car is bedded with straw, there is bound to be some leakage. If the operator takes the trouble to clean the tracks after a car is loaded, there will not be many chances for derailment, but the usual method of shoveling the tracks clear is both laborious and expensive.

The method used for keeping tracks clean at the plant of the Flint Crushed Gravel Co., Des Moines, Ia., is not only inexpensive but one of great rapidity.

On either loading side of the plant is a narrow concrete runway which drains into the waste water pond and also a hydraulic monitor. As a car of sand is loaded and gravitated to the storage yard the attendant flushes the tracks clear with water from the monitor. The water and sand run into the concrete runway and thence to the waste water pond. This method keeps the loading tracks clear at all times and prevents derailment due to sand lodging on the tracks.



Loading side of plant. Arrow points to concrete runway



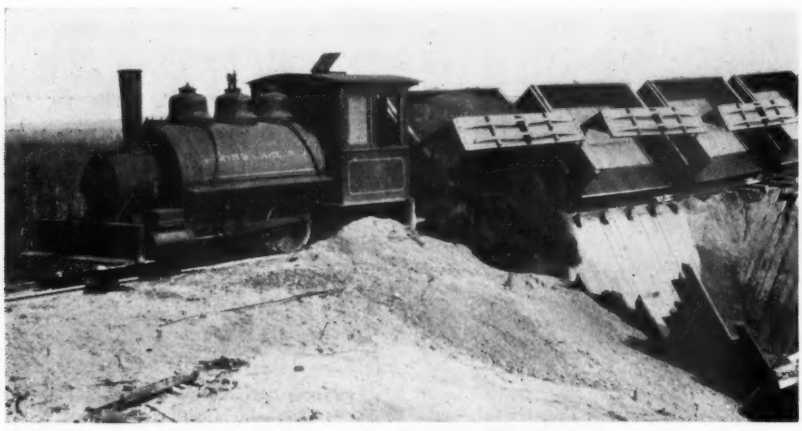
Showing concrete pit, loading tracks and monitor

Extra Strong Side-Dump Cars

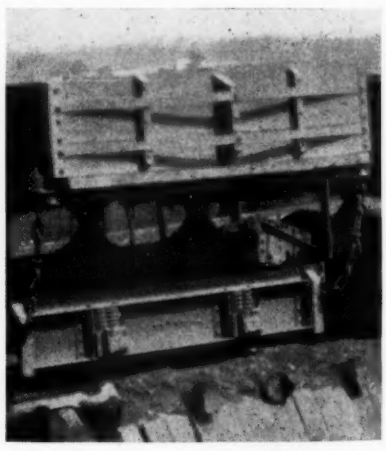
SIDE-DUMP, contractor-type cars seem to be most commonly used for sand and gravel pit operation. But many such cars, built especially for contractors' use, are designed for the life of a construction job rather than for the longest possible service. Naturally, in sand and gravel pit operation the longest possible life consistent with moderately light construction and reasonable cost is the thing sought for.

The Bennett Gravel Co., Spring Lake, N. J., has solved this problem by cars of special construction. These cars, shown in the accompanying views, have special steel trucks, made of riveted steel girders. Their dumping mechanism is the same as in the standard car of this type, but the sides are especially reinforced, as the views show, by a pair of steel straps and three wedge braces, which give the desired reinforcement against bulging and splintered sides, so often met with in stock cars of this design.

The capacity of these cars is about 10 tons each, and they are handled to and from the pit by 9x14-in. steam saddle-



Reinforced sides and special all-steel trucks



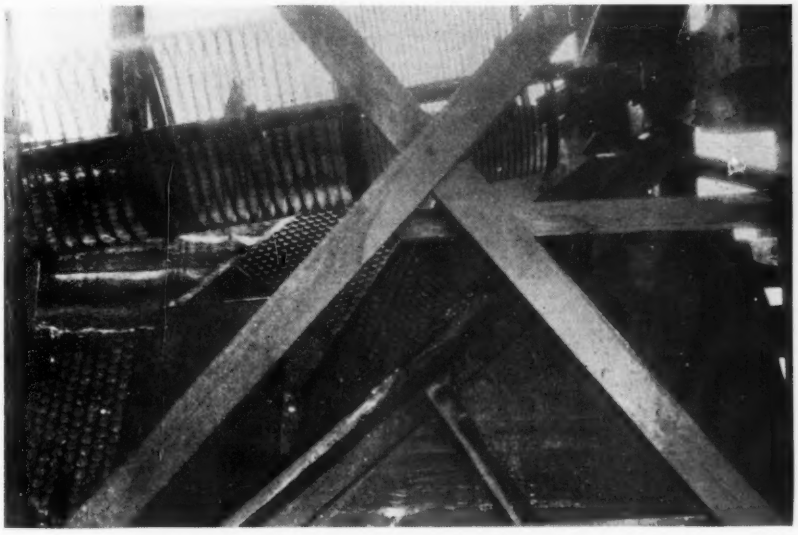
"Close-up" of special side-dump cars

tank locomotives on a haul of about 1,000 ft.

John M. Braly is general manager and Frank Travis is superintendent.

Use for Old Screen Plates

JOHN M. BRALY, general manager of the Bennett Gravel Co., Spring Lake, N. J., makes good use of his old screen



Old screens for lining for sand and gravel chutes

plates, no matter what size the perforations may be. The view herewith shows how. The plates are flattened out and used to line the plank chutes under the gravel screens.

The size of the perforations makes little or no difference because these openings quickly fill up with sand and pebbles and most of the wear comes on these rather than on the plate. While (as the view shows) the result looks like grandmother's patchwork quilt, the scheme is very satisfactory in other ways.

Frank Travis is superintendent.

Driller's Daily Time Card

TIME SPENT by a drillman on operations during the day's work can be profitably recorded on a daily time card. In *Big Blast Hole Drills*, the house organ of the Sanderson Cyclone Drill Co., Orrville, Ohio, there is shown the time card herewith illustrated.

This card is so satisfactorily arranged that no figuring is necessary on the part of the drillman, all calculations being made in the office. Each operation has a number specified on the back of the card. This number, together with time operation was started and finished, is inserted by the drillman in the space indicated on the front of the card. If the operation is drilling, which is the only productive operation, the number of feet drilled in the given period is recorded. In case any extra help is employed on or for the drilling outfit it is the duty of the drillman to fill the space furnished for this purpose with the key number or numbers of the men that assisted him. This permits a double time check.

DRILLERS DAILY TIME CARD

DRILL NO._____ DATE_____

DRILLER_____ KEY NO._____

OPERATION NUMBER	STARTED	STOPPED	FEET DRILLED	EXTRA HELP

DRILLERS DAILY TIME CARD

INSTRUCTIONS

(1) THE COLUMN HEADED "OPERATION NUMBER" ON REVERSE SIDE OF CARD MUST SHOW A NUMBER INDICATED IN TABULATION BELOW. FOR ANY OPERATION NOT COVERED, MARK A BLANK NUMBER "SEE REMARKS" AND DESCRIBE THE OPERATION UNDER "REMARKS" BELOW

1	DRILLING	13	WAITING FOR SUPPLIES
2	MOVING	14	WAITING FOR BITS
3	MAKING ROAD	15	WAITING FOR INSTRUCTIONS
4	CHANGING BITS	16	DRESSING BITS
5	SPLICING CABLE	17	LAYING WATER LINES
6	RESOCKETING CABLE	18	LAYING POWER LINES
7	MACHINE TROUBLE	19	DELAYED BY BLAST
8	ENGINE OR MOTOR TROUBLE	20	DELAYED BY RAIN
9	POWER OR FUEL TROUBLE	21	
10	TOOLS STUCK	22	
11	FISHING JOB	23	
12	WAITING FOR HELP	24	

(2) FILL IN KEY NUMBER OF ANY EXTRA HELP EMPLOYED ON DRILLING OUTFIT IN COLUMN PROVIDED ON REVERSE SIDE

REMARKS

Rule for Determining Belt-Slip Percentage

By W. F. Schaphorst, Newark, N. J.

HAVING been asked to give a simple but accurate rule for finding the percentage of belt slip, I offer the following:

Most rules as given in manufacturers' catalogs, text books, etc., are inaccurate because they do not take the thickness of the belt into account. My rule is not given as being perfect, but it will give results that may be used as reliable. All measurements should be in inches.

(1) Multiply the revolutions per minute of the driven pulley by the sum of its diameter and belt thickness; then by 100.

(2) Multiply the revolutions per minute of the driver pulley by the sum of its diameter and belt thickness.

(3) Divide (1) by (2) and subtract the quotient from 100. The difference is the precentage of slip.

For example, a 10-in. driven pulley runs at a speed of 360 r.p.m. The belt thickness is 0.25 in. The 20-in. driver pulley runs at a speed of 200 r.p.m. What is the percentage of belt slip?

Applying (1) we get 360 times 10.25, which is equal to 3,690. Then multiplying by 100 we get 369,000.

Applying (2) we get 200 times 20.25, or 4050.

Applying (3) we get $369{,}000 \div 4050 = 91.2$.

Subtracting that from 100 we get 8.8 per cent slip.

Thrown into the form of an algebraic formula the rule becomes:

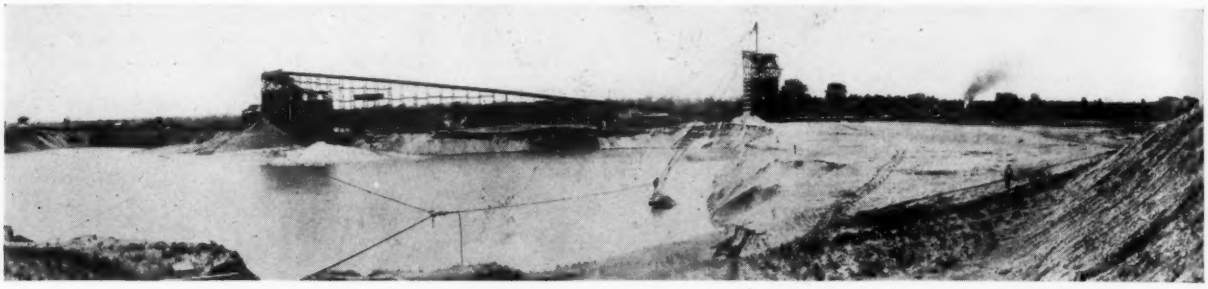
$$\text{Per cent slip} = 100 - \frac{100\,(d+t)\,n}{(D+t)\,N}$$

Where d = diameter of driven pulley, inches.
t = thickness of belt, inches.
n = speed of driven pulley, in r.p.m.
D = diameter of driver pulley, inches.
N = speed of driver pulley in r.p.m.

Extending a Dragline Operation

The McGrath Sand and Gravel Co., Pekin, Illinois, Installs a Field Storage Bin and Belt Conveyor to Extend the Working Area

A DRAGLINE CABLEWAY excavator is generally conceded to meet a very wide range of conditions and requirements in sand and gravel operations, but it is obvious that once the material within reach of the excavator has been mined out, it is necessary to either move the mast and the washing plant to a new location where the dragline can get within reach of the material, or to supplement the dragline with additional equipment which would assist in conveying the material to the plant for washing, sizing and loading.



Panoramic view of Pekin plant after the addition of field storage bin and belt conveyor

The Pekin, Ill., plant of the McGrath Sand and Gravel Co., whose main offices are in Lincoln, Ill., was built in 1917, and was operated with a 1½ cu. yd. Sauerman dragline cableway excavator whose maximum area of operation would not exceed a radius of 600 ft. In 1920 it was found that the excavator had reached its limit of operation and so it became necessary to install some means whereby the area of operation could be extended, for the deposit was still some 60 acres in area with the material running to an average depth of 40 ft. With the aid of the engineering departments of the Link-Belt Co. and Sauerman Bros., both of Chicago, Ill., the problem was solved in the following way:

Field Storage Bin

A loading bin was installed 545 ft. away from the original washing plant and on a direct line from it. The mast and dragline cableway excavator from the original plant were transferred to the new loading bin so that the area of operation from the original point was increased from 600 ft. to 1200 ft. The mast, as before, is 108 ft. high and the excavator bucket discharges into a 15x30 ft. hopper at the top of the loading bin. The bin under the hopper is capable of holding 800 tons of material. Thus, it adds to the flexibility of the plant, since it insures an adequate supply of material in case the excavator or hoist should break down.

Original plant and dragline excavator installation

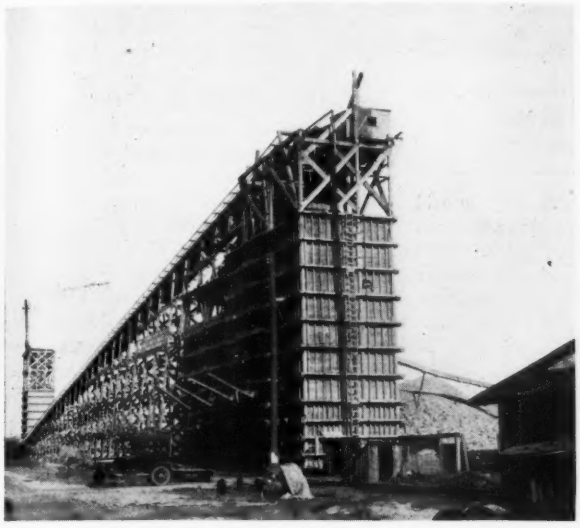
Belt Conveyor

A belt conveyor 24 in. wide, 545-ft. centers, operating at 300 ft. per min. and at an angle of 20 deg. conveys the material from the loading bin to the original washing plant. The material at the loading bin is discharged to the belt conveyor through two hand-controlled gates and as the material reaches the top of the washing plant it goes through successive

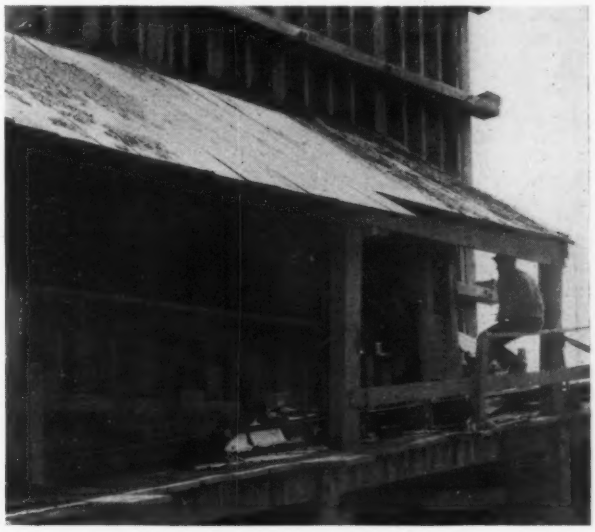
stages of washing and screening until it is deposited into bins from which the railroad cars are loaded.

The dragline cableway excavator, which is driven by a two-drum electric hoist, may be operated with the plant shut down or the washing plant may be operated with the cableway excavator shut down. During the busy season, the operation may be so arranged that the raw storage bin may be empty when the day shift gets off duty and an extra night hoist operator can fill the storage bin so that when the full day crew comes on duty again it can start washing the material immediately, and by steady running, not only keep up with the hoist men, but also wash and screen the material stored up by the night operator.

This is the first season that the Pekin plant has been operated by this method and it is claimed to be very satisfactory. The plant has an average capacity of 30 cars of material per day. By installing this system the company can continue to operate on its original washing plant for several more years. J. H. Edwards is superintendent at this plant.

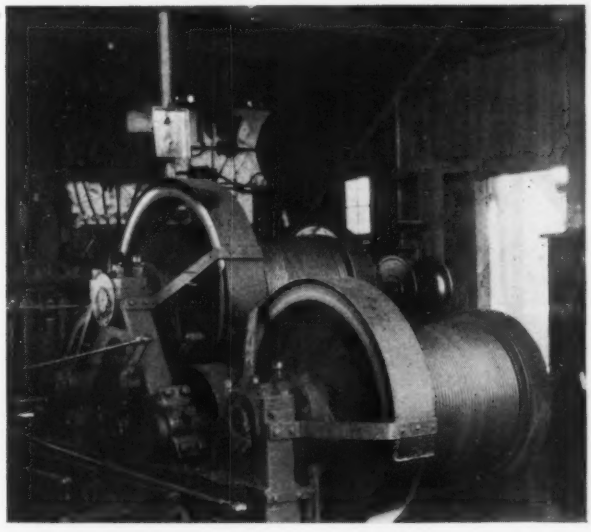


Looking from washing plant to field storage bin



Loading belt conveyor at field storage bin

Belt conveyor from field storage bin



Two-drum electric hoist operating cableway excavator

Economy of Coal in Cement Kilns

THE chief reproach made against rotary cement kilns is the great consumption of fuel. This fact, according to Dr. Valeur, writing in the *Revue des Material Construction,* is due to an excessive draught of air, whereas when reduced to the strictly necessary amount, the heat of the waste gases and dust from the cement in them decrease, giving an economy in both fuel and cement.

The Valeur process consists in diminishing the velocity of the gases escaping from the kiln on the entire section of the chimney by means of several iron gratings, the width to distance of the openings in them being learned by experience. These gratings must be taken out to be brushed, which can be done in a couple of minutes. The dust retained falls to the bottom of the flues from whence it is carried away by screw conveyors to the feed hopper of the kiln. The proportion of dust is not negligible.

Finally, the energy needed for grinding falls from 115 to 106 kwh. per 100 kg. of clinkers. Then there is the economy in repairs, and lining the kiln which can be executed in 36 instead of 54 days per year.

Sand Settling and Sand-Settling Devices

Part II—No. 14—The Field of Classification as a Whole—Comparison with Other Methods of Getting the Same Results

By Edmund Shaw
Allen Cone Co., El Paso, Texas

IN CONCLUDING this series, attention will be given to the field of classification as a whole, and comparisons will be made with other methods of accomplishing the same results.

Classification is but one of a number of methods for separating finely divided material into sizes, or for separating two or more substances according to their densities. Screening is perhaps the most widely used of these methods, but there are also air separation, separation by centrifugal force, and, to a small extent, magnetic and electro-static separation are rivals of classification in certain fields.

Choice of Separation Method

The engineer thus has a choice of methods, and he will employ the one which is best suited to the conditions of the problem in hand. For example, he would never think of using any sort of classifier to take the place of a 2-in. gravel screen, but neither would he think of using a screen of any kind to separate clay from very fine sand. He might prefer air separation for the preparation of talcum powder, but he would turn to classification for the fine grinding of ore. Magnetic separation might be used to separate fine iron particles from crushed slag or foundry sand, but classification would be employed if he had to deal with a non-magnetic mineral under the same conditions.

Therefore it is quite clear that every separation method has a certain field in which it is pre-eminent and other fields which it must share with rivals. But before considering the especial field of classification, it might be well to consider some of the uses to which it is applied.

Of special interest to the readers of ROCK PRODUCTS is its use in grinding silica and gilder's whiting and the grading of blast sands and sands and crushed garnet for making sandpaper. Also, its use as a method for recovering byproducts, which will be mentioned later.

It is also considerably employed as a laboratory method, where it is dignified by the name of elutriation. Building sands, soils and like materials are constantly tested by elutriation for the presence and percentage of the fine, insoluble material generally known as silt.

Sizes for Classification

As regards the sizes to which classification is best adapted, these may be said to begin with ¼ in. and run down through the screen mesh sizes to sizes so small that screens cannot be made to measure them. On ordinary substances, at least, screening is never attempted as a commercial proposition below 200 mesh, so classification has this part of the field to itself, except for air separation on a limited number of substances. On the sizes from ¼ in. down to 200 mesh, both classification and screening are used, but screening is found to be increasingly difficult as the size of the mesh employed decreases. The cost of fine screening, owing to the low capacity of a fine screen and the high cost of the fine screen fabric used, is fairly high.

In what may be called the debatable ground, the choice of classification or screening will be governed by the conditions of the particular case, as the work of the two is about the same. If the substance to be handled is mined dry and is to be sold dry, there is an advantage in screening, since it may be a dry process, and the expense of wetting the material and drying it again is avoided. But it is only fair to point out that this expense may sometimes be more than offset by other considerations, such as the ease of wet crushing, the dangers of dust, dust losses, etc. Dust losses may run to very considerable figures.

Editors' Note

With this installment this series of articles is concluded. The series, begun in the June 4 issue of Rock Products, has covered the subjects of classifying and settling sands in a most comprehensive manner.

It is our understanding that the author intends to publish these articles in book form, so that rock products producers may have an authoritative textbook on sand settling and sand-settling devices.—The Editors.

Efficiency of Screens and Classifiers

There is also the matter of efficiency, and it will probably surprise some of the readers of this article to learn that classifiers are considerably more efficient than commercial screens on the finer sizes. Usually the efficiency of screens is not tested. The operator knows that nothing coarser than the mesh size can get through the holes, and is satisfied so long as the screen does not break. What he does not see is that a very considerable quantity of fines, which should go through the holes, refuses to do so and stays with the oversize. There is also the matter of screen wear, especially noticeable in screens of punched metal. One often sees these run until the holes are enlarged to nearly twice the original width.

Not Rivals, But Allies

The writer's idea in saying this is that he wishes to thoroughly dispose of the view that some writers take—that classification is a poor substitute for screening, when, as a matter of fact, the evidence is the other way. And while the writer is more interested in classification than screening, since it is a part of his business, he has no desire to start what seems to him an unprofitable discussion, because he believes that classification and screening are not rivals—they are allies! In the cases in which either might be used, an intelligent consideration of the attending circumstances will generally show a good reason for preferring one to the other.

As a matter of fact, it may be shown that the two in combination will often give better results than either would give by itself. To illustrate this, let us suppose that we have material that contains only a few grains of oversize. It would be far better to take these out by a screen than by a classifier.

On the other hand, let us suppose that the material contains a large quantity of fines. The work of the screens will be considerably better if these fines are removed by a classifier before screening begins. Of course, wet screening is spoken of here, and in wet screening fines are very apt to stick to coarse pieces of oversize by a film of water. If these are washed off by classification before screening begins, the coarser product will be much cleaner.

In one installation of the kind last mentioned some 40 per cent of fines was taken out before the product was sent to the screens. The removal of so large an amount was worth considering merely from the tonnage standpoint, as the material had to be dried before screening and the fines were of little or no value in the next stage of the process.

Separation Only Part of Process

In considering these matters, it must always be remembered that separation is only a part of the entire process, and the method of separation adopted will be governed by a number of considerations, some of which may not be apparent at first.

As an example of this, take a plant producing blasting sand. In the particular plant the writer has in mind, four sizes of this sand are produced. The sand came from the washing plant and was dried and then screened. Wet separation of the product and drying each size by itself was considered; it was not adopted, however, as it made the plant a little more complicated on account of having to provide storage and a way of handling four separate sizes before drying.

After the plant had been running some time it was found that the four sizes did not sell evenly. There might be a run on No. 2, say, and a lot of Nos. 1, 3 and 4 had to be stored while this was being produced. The storage of the dry material was expensive, as it had to be protected from the weather. Eventually a wet separation plant was put in to do just that which was avoided in the original design of the plant, the storing of the wet sands after separating into sizes, and the drying of each size separately.

Classification to Recover Byproducts

Classification may often be used to recover a valuable byproduct from material that has been sent to waste. The writer saw an example of this the other day at a sand plant in New Jersey. In this locality there is a good market for both sand and clay, and the waste waters of the plant contained considerable clay, so full of fine sand that it could not be sold. Settling tanks were put in to form a sort of surface current classifier, and these tanks took out the sand without losing much of the clay. The clayey water was run to slip ponds of the type used for clay settling, and the clay recovered there in a marketable condition.

At a plant using sand for grinding slate it was found possible to wash off the slate dust from the used sand and recover the sand fit for re-use. The slate dust classified from the sand in this way had a commercial value that would have made the process pay if no sand had been recovered.

(Concluded)

Marquette Stone Products Plant

Property Has 21 Acres of Limestone — Four Divisions Enter Its Yards—Equipment Provides for Crushed Rock, Lime and Riprap Output

THERE is now in operation the newly completed stone crushing plant of the Marquette Stone Products Company of Marquette, Iowa. This plant is turning out crushed stone for a street paving job at Waukon, and has been doing a good riprap business with the Chicago, Milwaukee and St. Paul Railroad while getting the quarry in shape for crushed stone orders. The company will also get the riprap business of this railway as a side line to its crushed rock and lime for agricultural purposes.

The company has 21 acres of bluff of solid limestone, with only a slight overtopping of dirt; the hill at its highest point is 200 ft. The company claims to have the best quarry and the best location in Iowa. The stone has been tested at Iowa State College and found to have no superior in the state, testing not only very high for hardness but up to 90 per cent

After a blast at the Marquette quarry

Loading the crushed rock. Manager Berry standing at extreme right

lime carbonate. The quarry is located partly within the yards of the Chicago, Milwaukee and St. Paul Railroad at Marquette, thus giving the company unusual facilities for economical and quick shipment. With four Milwaukee divisions entering the yards, there are miles of switching tracks available. A track under the quarry bins runs into the yards.

The equipment consists of two Austin gyratory crushers, a No. 6 with a 40-h.p. motor, and a No. 4 with a 25-h.p. motor; a 4x20-ft. screen with 6-ft. dust jacket; No. 6 elevator of 55-ft. centers; 10-ton crawl and a 3-stage centrifugal pump operated by a 50-h.p. motor. The overburden is removed hydraulically at a minimum of cost.

Five storage bins of two cars' capacity each store the crushed stone. As the quarry is high above the surface, the loading of both crushed rock and riprap is by gravity. A 25-h.p. motor runs each of the two Sullivan rotary air drills and a 20-h.p. motor the Cyclone well drill.

As the demand for agricultural lime is increasing among Iowa farmers, the Marquette company has recently added to its equipment a belt conveyor for its storage dump for agricultural lime.

On the floor of the quarry, which is 50 ft. above the level of the side tracks, there are 1000 ft. of quarry tracks laid down in 30-lb. rails.

An extensive road-building program is planned for northeastern Iowa for next year, and as there is no crushing plant nearer than Dubuque and La Crosse, the company believes that it stands an excellent chance, because of shorter haul, to get much of the crushed rock business in that state.

Business men of northeastern Iowa have purchased $50,000 worth of stock in the Marquette company. Six banking groups in Clayton, Allamakee and Winneshiek counties are among the largest stockholders.

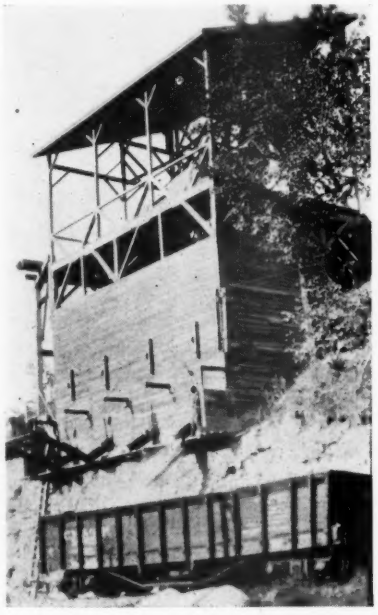
The officers are: President, John Kramer; vice-president, Fred J. Figge; secretary and manager, J. M. Berry; treasurer, E. A. Nichelson. Directors: J. J. Arnold, J. W. Boyle, J. J. Burke, V. T. Price and E. C. Ferris. John Trygg, a practical quarryman, is foreman of the plant. W. F. Bickel was the engineer in charge of the plant installation.

Lime Requirement and Reaction of Lime Materials With Soil

EXPERIMENTS conducted at the Ohio Experiment Station by C. J. Scholenberger are reported in which various lime materials were mixed with soil in undrained pots, watered, and kept partly outside and partly under greenhouse conditions, and determinations made of residual carbonate, lime requirement, and accumulated nitrates.

A relatively pure high-calcium limestone, calcite and magnesite were very similar in behavior. Approximately one-half of an application equivalent to 3.1 tons per acre of these materials ground to pass a 100-mesh sieve was attacked within four weeks and two-thirds within 28 weeks. The natural carbonate dolomite was found to be about 50 per cent more resistant than the other materials, while precipitated calcium carbonate was much more easily attacked by the agencies of decomposition.

Caustic lime was apparently more reactive than the precipitated carbonate, although with time the differences noted became less. Carbonate formation was



Loading the crushed rock, Marquette Stone Products plant

found to result from an application of chemically prepared magnesium oxide, and the amounts found gradually increased with time. On the other hand, the disappearance of carbonate from an equivalent application of chemically prepared magnesium carbonate was complete within a month, although traces of carbonate were afterward formed. Of two samples of slag tested, so-called dicalcium silicate was found to react with soil as readily as precipitated calcium carbonate, but blast-furnace slag was less reactive than any other material tested.

Coarsely ground limestone had much less effect in reducing lime requirement than the finely ground. Limestone ground to pass a 100-mesh sieve was found to be utilized at nearly the same rate in an acid silt loam and an alkaline clay loam, but carbonate disappeared much more rapidly from an acid clay loam. The lime requirements by the vacuum method were comparable in the cases of the first two soils, but twice as great with the third.

The quantitative relations between bases not residual as carbonate and reductions in lime requirement were found to be reasonably close, a possible consumption of bases by nitrification being considered. The evidence obtained indicated that the interaction of soil constituents and calcium carbonate is sufficiently regular and quantitative for the indications of a lime-requirement method, based upon the reaction, to be of practical utility, provided the proper precautions are observed. The indications of the lime-requirement method employed were found to depend to a great extent upon such factors as the manner of preparation of the sample, the temperature, and the time allowed for the determination.

No conclusive evidence has been obtained that heating is an undesirable feature of a perfect lime-requirement method, if we understand by that term a satisfactory method for the study of the relations between base absorbents and added bases in the soil. On the other hand, heat may be of great advantage in hastening a naturally slow reaction and may enable differences to be indicated with an exactness not otherwise attainable in a reasonable length of time.

Influence of Fineness and Amount of Lime on Soil

WITH pot culture experiments on oats, red clover and carrots on acid soil deficient in lime, P. Liechti and E. Truninger, two German experimenters, have determined the influence of the fineness and amount of lime applied to the soil. Calcium carbonate of five different degrees of fineness was used, having grain sizes of from less than 0.11 to 2 mm., and was added in amounts varying from 1,000 to 8,000 kg. per hectare (890 to 7,120 lbs. per acre). It was found that degree of fineness and amount of application of lime had only a slight influence in the case of oats. The coarse-grained lime in relatively large additions had a favorable influence on red clover and carrots, while the fine-grained lime had an injurious effect, especially on carrots. The depressing influence of fine-grained lime on the action of bone meal H_3PO_4 decreased as the lime grains increased in size.

Lime of 3 mm. size had no depressing influence. The influence of lime on the action of superphosphate P_2O_5 was determined more by the physiological behavior of the test crop than by the degree of fineness of the lime. Fine and coarse-grained lime had about the same favorable influence on the nitrification of $(NH_4)_2SO_4$.—*Chemical Abstracts.*

Humanizing the Dusty, Dry Lime Business

"Commodore" McMillin, of the Tacoma and Roche Harbor Lime Company, Has Annual Harvest Festival for Employes and Friends

OUT on the northwest coast men "live." Maybe it is the closer contact with primeval nature—the snow-capped mountains and the forests—but whatever it is, they do not reduce all their business transactions and relations to quite such a cold-blooded basis as we do in the East. In a measure that may explain the views herewith and the text which follows.

Unfortunately the editor cannot give a first-hand account of Mr. McMillin's party. He first read an account of it in a Seattle newspaper. Through correspondence he was able to obtain the photographs. Incidentally, he has obtained an invitation to next year's festival—and he hopes business will take him to that neck of the woods about next September.

Mr. McMillin is a director of the National Lime Association, and it is believed the lime industry will read of his doings with as much interest as the editor did.

Recreation court at Hotel De Haro transformed into a banquet hall, Roche Harbor, Wash., Sept. 4, 1921

The following account of the "festival" (from the Seattle paper) was evidently written by a participant:

Not Dependent on Prosperity!

Many people and some companies and corporations, too, acquired during the war and during the period of bountiful prosperity which followed, some habits of generous entertainment and good fellowship which in these more pinched, if not more sober times, they find it necessary to part with. This state of affairs is far from the case with the Tacoma and Roche Harbor Lime Co., of which John S. McMillin is president. In fact, the only effect the war had upon "Commodore" McMillin and his company was to reduce both business and profits about 90 per cent. But through adversity, as in the years of prosperity, the habit acquired many years before the war of holding an annual harvest festival for employes and friends at the company's property on the northern shores of San Juan Island has been retained. No matter how dark the clouds or how forbidding the signs, once a year everyone, including Mr. McMillin's friends in high places and the Indian in the company's employ, has joined in one glorious good time, extendng over several days and the refrain—

The salmon barbecue, McCracken Point, Sept. 4, 1921

Complete satisfaction at the end of the salmon barbecue

We shall know each other better,
We shall know each other better,
Better far than yesterday;
We shall know each other better
From the handclasp of today.

has had a real and not soon to be forgotten meaning to those who, accepting the generous hospitality, have at the end of the third day waved a last goodby and turned to find themselves fairly loaded down with largess from the pantry, the garden and the orchard.

The McMillin Welcome

Mr. McMillin and his daughter, Miss Dorothy, extended the first welcome to their guests at Friday Harbor Saturday noon and the ride to Roche Harbor was taken on the company's launch. There Mrs. McMillin met the voyagers and throughout the remainder of that day and the two which followed graciously shared with her husband and daughter the responsibilities of lavish hospitality and entertainment.

Here Is Where Your Mouth Begins to Water!

Saturday evening's banquet was set beneath lanterns on the croquet ground and the guests fell to with a will when the waiters entered bearing aloft two immense platters loaded with steaming hot roast little pig, around which was piled sweet potatoes, apples and other good things. A program of music, toasts and some serious discussion of how to make the tourist realize the beauties of the San Juan Islands, and how to teach the residents of Western Washington to at least know where the islands are situated filled the hours until midnight.

Early Sunday morning the visitors were taken to see the lifting of many thousands of salmon caught during the night in a near-by fish trap and toward evening of the same day they saw the herring traps.

Barbecued Fish—and Everything!

The afternoon was spent in a slow tour of the Sound about near-by islands, the party being taken on a panoplied scow with two gasoline boats as the propelling power. Some hours earlier than the guests' arrival the chefs had gone to the beach selected and there, after heating the rocks from a beach fire, had carefully buried a dozen large spring salmon, each enveloped in a shroud of kelp. At the appointed hour this barbecued fish was served and with it the roasting ears which, likewise, had been cooked in the hot rocks. The entertainers on the barge were only interrupted by the serving of dinners and after the moonlight ride, supper, and the hundred or more guests parted for the night with grateful good wishes for their generous host.

Monday the grain field, where Mr. McMillin is making some experiments in the use of lime in promoting the productivity of oats, and the company's orchards and gardens were visited and in the afternoon the lime quarry, kiln house, cooperage and other accessories of the plant were inspected and the various processes of mining, manufacturing and marketing explained.

The occasion was an education in the marvelous beauties of the San Juan Islands, the importance of the lime rock industry and a long-to-be-remembered example of good fellowship generously extended.

Roche Harbor lime now goes to Java and the Philippines, to Hawaii, Peru and Chili, and a promising new market is opening in Cuba where Cuban sugar planters, learning from Western refiners the superiority of the Washington products are negotiating for a supply. But looking back upon his long years of residence on San Juan Island, where he has seen the forest cleared and second growth become towering trees and recalling friendships formed and only broken by death's hand, Mr. McMillin is still full of vigor and this year, as in the past, was unanimously acknowleged the youngest participant in Roche Harbor's annual festival.

A feature at one of the banquet tables: Allegory—The fairy wakening at the call of the butterfly

Lime in Water Purification

A Large Field for Development—Plants Can Be Built and Operated at Reasonable Cost if Properly Designed

By C. Arthur Brown
Chief Engineer, Engineering Bureau, Water Purification, American Steel and Wire Co.

LIME IS SOLD in two forms, one being a more or less chemically pure form of oxide of calcium usually known as lump lime, the other being an equally more or less pure form of calcium hydrate known as hydrated lime. For any water purification work any and all impurities are detrimental. Oxides of alumina or iron are mildly objectionable, magnesia being seriously so. Some purchasers penalize heavily for magnesia, and all should do so. Core and overburned lime are inert and objectionable and should be absent. Air slaked lime is practically useless and of little value.

It is difficult to keep lump lime without its undergoing some air slaking. It is almost impossible to thoroughly degranulate lump lime in lime-slaking tubs in a reasonable period of time and unless it is thoroughly degranulated considerable portions do not go into solution. To be of any service in water purification work the lime must go into solution.

Hydrate Most Popular

For these reasons, calcium oxide or lump lime does not find as many friends as the hydrated lime. The latter, coming in bags, can be handled and stored to somewhat better advantage and stocks can be kept for longer periods of time, with less loss of efficiency by deterioration.

Lime is used for two purposes in modern water purification systems. One of these is to assist in precipitating a coagulant, the other is to soften.

The first mentioned contemplates the use of the lime in relatively small amounts to assist in clarifying the water without materially affecting its hardness.

In the second use, the lime is employed to soften the water without marked consideration for its clarification effects, although these obtain usually. The amount of lime used depends on the amount of bicarbonate hardness and magnesia present in the water to be softened, the amount of lime employed being relatively large in comparison when it is employed only as an accelerator of coagulation.

Where iron sulphate is used as a coagulant, it is found desirable in most cases to use from ¼ to 2 gr. of hydrated lime per gallon of water in order to expedite the formation of the coagulation, after which the coagulated water may be rendered brilliantly clear by rapid filtration. In such cases there is no material softening action induced by the small amount of lime employed.

Lime for Water Softening

Where it is desired to soften a water lime may be used with advantage under certain conditions. The only hardness which can be eliminated by using lime will be that due to the presence of bicarbonate hardness, such hardness being caused by bicarbonate of lime and magnesia.

A bicarbonate is a carbonate having two molecules of carbon dioxide. A monocarbonate is a carbonate having one molecule of carbon dioxide. Bicarbonates are readily soluble in water, monocarbonates being far less soluble.

By robbing a bicarbonate of one of its two molecules of carbon dioxide, it can be converted into a monocarbonate.

Hydrated lime in solution contains no carbon dioxide. It has, however, a great affinity for this gas, so much so as to be able to rob a bicarbonate of one of its molecules. By such robbing, the hydrate of lime is converted into a monocarbonate.

Because of this, where a hydrate of lime in solution is added to a water which contains bicarbonates of lime in solution, the hydrate robs the bicarbonate of one of its molecules of carbon dioxide and is converted from a hydrate to a monocarbonate, while the bicarbonate so robbed is also converted to monocarbonate and both monocarbonates are rendered insoluble and precipitate out of solution, thus softening the water.

The affinity of lime hydrate for carbon dioxide is so great that it can rob a bicarbonate of magnesia of both its molecules of carbon dioxide, thus reducing the bicarbonate of magnesia to the hydrate of magnesia. The hydrate of magnesia is less soluble than either the bicarbonate or monocarbonate of magnesia, and if enough caustic lime be added any bicarbonate of magnesia will be robbed of both its molecules of carbon dioxide, converting the caustic lime to monocarbonate of lime and the magnesia bicarbonate to hydrate of magnesia, thus precipitating both the caustic lime added and the magnesia present in the water, thus softening the water to this extent.

Advantages of Soft Water

Most of the lime used in water purification is used for softening work. There are thousands of small softening plants in commercial use in this country, and more and more cities are realizing the value of softened water as a community blessing and are softening all the water used for all purposes.

Meats and vegetables cooked in softened water are more nutritious than when cooked in hard water. Linens, cottons and woolens are more durable if washed in softened water rather than in hard water, while the saving in soap and labor is also very large. Coffee and tea are better made from softened water and less coffee and tea are wasted. Steam is more easily, cheaply and safely produced from softened water. Various sundry and commercial uses are better served by soft water, some being seriously handicapped by hard water. Any city, industry or institution may soften its hard water and save money by so doing.

The design of a modern softening plant for large or small supply is a matter calling for a considerable degree of skill and experience if the best and most economical results are to be obtained. These plants are reasonably cheap to build and operate if properly designed and constructed, otherwise they may be either cheap or costly to build, but will be expensive to operate and may be unsatisfactory in results. The best engineering talent procurable will be found the cheapest in the long run.

The use of lime for this purpose is extensive and must increase as more and more people come to realize the attendant benefits.

Agricultural Lime

ALL SOILS that need lime do not need it for the same reason, says Farmers' Bulletin 221. As the result of liming, one soil may be benefited chiefly through the neutralization of its acidity and another through the improvement of its physical condition, but in nearly all soils the decomposition of the organic matter will be hastened and in cases all effects will operate at the same time.

Varied Operations of the Santa Cruz Portland Cement Co.

No. 2—Cement for Shutting Off Water in Oil Wells—Recovery of Potash

By Llewellyn T. Bachman
Directing Chemist, Santa Cruz Portland Cement Company, Davenport, California

IT MAY NOT be generally known that state laws regulating the shutting off of water in oil wells, as well as laws on other conservative restrictions in the oil industry, are diligently prosecuted.

As the productivity and life of an oil well largely depend upon the exclusion of water, the cementing process, as the most practical, and the numerous difficulties involved in its application have become the subject matter of wide discussion.

Among the difficulties arising from physical, chemical or mechanical causes, through any one or all of which cementing failures may be traced, consideration will be given those due to localization of the cement in cavities or water bearing sand stratas, the size and character of which cannot be predetermined to the unknown condition of space between wall and casing; the presence of crevices, fissures or penetrable formations into which cement may filter; to the use of insufficient quantity of cement, insufficiently slurried; to the use of excessive quantities of water; to methods employed for depositing the slurry; to the dilution of the slurry in the well with mud from mud-laden fluid, together with precipitant solids from the mud fluid and well waters, through which the exclusion of waters has either failed or full opportunity given the destructive agents to exert their influence upon the deposited cement.

No attempt is made in this series of articles to describe the fundamental principles governing the success or failure of a cementing job, but to point out wherein the cement manufacturer may render valuable assistance to the oil industry by manufacturing a cement which will fill as far as possible the requirements of the cementing process and effect an increase in the percentage of permanent successes.

Whatever the method for depositing the cement may be, whether by dump boiler, tubing or Perkins plug system, the cement is always slurrified without the addition of sand to a consistency aimed to contain between 38 and 50 per cent of water; the use of 40 per cent of water or less is eminently the safer method.

This company has concurred with the writer's suggestion to make a cement of more specific value for oil well development and making known precautions which should be observed.

Our principal efforts were applied in combating the detrimental effects of precipitant salts from mixing solutions and those surrounding the cement at rest; to attaining highest specific gravity and density of slurrified mass; in accounting for the quality and gravity of sludgy fines of non-hardening value baled from wells; to the consistency of cement slurry most favorable to prompt hardening and permanency; to improvements in process of mixing for better slurrification with minimum percentages of water; to better grinding for mitigating the effect of grading out; to the development of a prompt-hardening cement of high strength in the first 24-hour period for maximum resistance and standardizing testing methods for cement slurries.

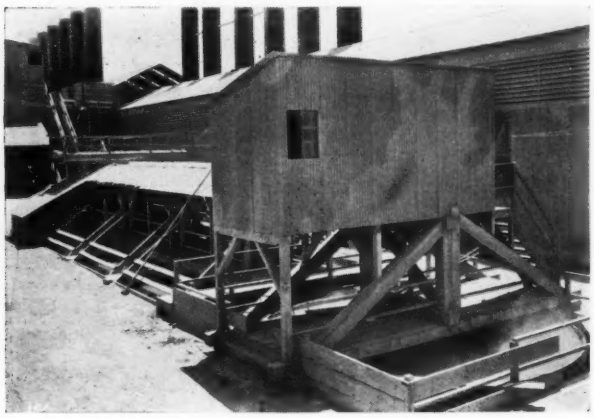


Fig. 9—Dorr thickener and liquor reservoir

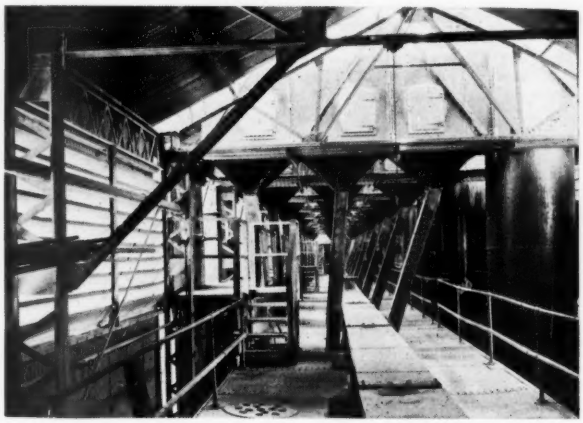


Fig. 10—Horizontal flue and dust chutes leading to kiln bins

The manufacture of special oil well cement is made possible by cleaning out all tube mills bins, kiln bins and coolers, changing the formula for raw composition, giving attention to processing and burning and forming a separate pile for the clinker.

The grinding equipment comprises six No. 8 Gates ball mills and six 5½ ft. x 22 ft. Gates tube mills, with facilities for control similar to that used in manufacturing commercial cement.

The finished product is stored in a bin of 10,000 bbls. capacity, adjacent to two Howe machines for packing.

Shipments are confined chiefly to California and Wyoming at the rate of 6,000 bbls. per month.

Recovery of Potash

The original process involves the separation of dust by water sprays from waste gases en route to the atmosphere from the burning of raw materials in rotary cement kilns, and the recovery of a dry, high grade potash (see Fig 8 in ROCK PRODUCTS, December 3, page 32) of uniform quality from the dust-free potash-

Chemical Analysis

	SANTA CRUZ Special Oil Well Per Cent	SANTA CRUZ Commercial Per Cent
Oxide of Silica (SiO_2)	18.67	20.46
Oxide of Iron (Fe_2O_3)	5.15	2.52
Oxide of Alumina (Al_2O_3)	6.75	7.58
Oxide of Lime (CaO)	64.35	64.26
Oxide of Magnesia (MgO)	1.84	1.96
Sulphur Trioxide (SO_3)	1.52	1.53
Oxide of Potassium (K_2O)	.48	.37
Oxide of Sodium (Na_2O)	.55	.46
Loss Ignition	.82	.91

Physical Properties

	SANTA CRUZ Special Oil Well	SANTA CRUZ Commercial
Specific Gravity	3.170 to 3.19	3.107 to 3.13
Vicat Needle Penetration	10 m m	10 m m
Fineness—Passing 100 M Screen	96.0 to 97%	95 to 96%
Fineness—Passing 200 M Screen	83.0 to 85%	80 to 81.5%
Consistency	21.0% H_2O	22.5 to 23.0% H_2O
SETTING TIME—		
Initial	1 hr. 30 m. to 2 hrs. 0 m.	2 hrs. 0 m. to 2 hrs. 30 m.
Final	3 hr. 0 m. to 4 hrs. 0 m.	4 hrs. 20 m. to 5 hrs. 0 m.
TENSILE STRENGTH—		
24 Hrs. Neat	450 to 520 lbs. per sq. in.	400 to 440 lbs. per sq. in.
7 Day Neat	950 to 1150 lbs. per sq. in.	850 to 950 lbs. per sq. in.
28 Day Neat	1020 to 1200 lbs. per sq. in.	950 to 1000 lbs. per sq. in.
7 Day (1—3 Sand)	320 to 360 lbs. per sq. in.	340 to 370 lbs. per sq. in.
28 Day (1—3 Sand)	400 to 450 lbs. per sq. in.	420 to 480 lbs. per sq. in.

laden gases by electrical precipitation.

The principal objectives lay chiefly in the treatment of waste gases from a positive separation of the dust and the subsequent treatment of dust-free potash-laden gases for an efficient recovery of potash, in a condensed type of plant, without effecting a loss in cement clinker or in the quality of the cement.

The finely ground raw mixture contains an average of .83 per cent K_2O; the average K_2O content retained in the clinker is .54 per cent. The quantity volatized is about 2 lbs. of K_2O per barrel of clinker, and the recovered dust—in itself a part of the raw mixture—equals six tons per 24 hours for each kiln or approximately 5 per cent of the total amount fed to the kiln.

Both dust and volatilized salts are suspended and simultaneously present in the gases, infinitely mixed and extremely fine.

Fig. 10—Spray tower and stack

Information gained in the experimental procedure proved that the dust readily precipitates in favorable environment and that the salts do not.

Each is a solid, the dust as raw material particles of varied sizes and weight proportionate to the degree of agglomeration, and the volatilized salts, comprising sodium and potassium vaporized by heat, subsequently condensed to a liquid which finally assumes solid form.

Separating the dust from salt solids is practically impossible, as the dust is mixed with the vaporized salts, both of which are suspended in the kiln and exposed to the condensation of vaporized salts.

Whatever principle is used for separation, it must be designed to reduce to a minimum the dust passing into the salt and avoid excessive salt precipitation.

Coincident with temperatures of gases in dry-process rotary kilns, the bases are admitted into the recovery plant at approximately 1,400 deg. F. and at about 43 ft. per second. Allowing for stack friction, the gas volume is 35,000 cu. ft. per minute.

The first step in the process is cooling the gases and separating the dust from the gases in operative temperatures. The course is through a hopper-bottomed, brick-lined, steel horizontal flue (see Fig. 10) from the top of the kiln stack, cut off 40 ft. from the base to the spray tower, upon which is mounted a 20-ft. open emergency stack.

The object in thus placing the stack was threefold: maintaining a complete kiln unit independent of the recovery system and for emergencies; eliminating stack dampers for controlling the direction of gas flow; simplifying the operation.

The horizontal flue serves the double purpose of providing a closed channel for the gas flow and simultaneously storing the dust precipitated in transit. The dry dust is periodically discharged through spouting directly connected with the bins supplying the kiln feed.

Cooling Gases

Cooling the gases to 212 deg. F. is effected by water sprays in the spray tower. This temperature is not severe on the concrete construction and is a conducive temperature for recovery of salts in the electrical treater.

The quantity of water sprayed is governed by the degree of interference with the subsequent recovering of dry salts, therefore only such quantities are permissible as will not render soluble the salts in the potash-bearing fog as it emerges from the kiln, nor saturate completely the gas with water vapor. The quantity represents 75 gal. of water per minute for each kiln; 20 gal. are evaporated and carried with the gas.

Simultaneously with cooling the gases, the major portion of the dust is removed from the gases in the spray tower; the portion carried over is subsequently removed in the chamber underneath the electrical treater by gravity precipitation. The former, in a slurrified condition, is flumed to a Dorr thickener (see Fig. 9) for a concentration of the solids and the latter, which is dry, is returned to the kiln.

The concrete spray tower (Fig. 10) is 21 ft. high and 6 ft. x 10 ft. inner clearance, through which the gases take a zigzag course downward through 4-ft. x 6-ft. openings.

The concentrated solids of viscid consistency from the Dorr thickener are filtered by Oliver continuous filters; and the cake, containing 15 per cent of the salt originally volatilized and diverted with the dust, is dried in a rotary drier and

Fig. 12—Dry dust chamber underneath the electrical treater chamber

returned to the kiln for revolatilization of potash and for its value as raw material for clinker.

Filtering and drying should be eliminated in favor of a more direct method for feeding the slurrified dust to the kilns, a step now in process of development.

The solution separated by the filters is transferred to the recirculating liquor reservoir and then transmitted through the spray nozzles by a single-stage centrifugal pump under 30 lbs. pressure per sq. in.

The spray system is of duplicate installation for flexible operation and least interference with the recovery process.

The second step is gravity precipitation of the dust carried into the dust chamber (see Fig. 12) directly underneath the electrical treater chamber for controlling the uniform high quality of the subsequently recovered salts.

The exit gases from the spray tower are admitted into this chamber through one opening and pass to the central portion of the chamber, where they not only diffuse uniformly through openings communicating with the treater chamber above, but suffer a reduction in velocity.

Reduction in velocity without disorder affords the medium for precipitating the remaining 5 per cent of the dust not collected in the spray tower. This chamber is 30 ft. long, 13 ft. wide and 7 ft. high, separated from the treater chamber above by a floor with rectangular openings for the moving gases.

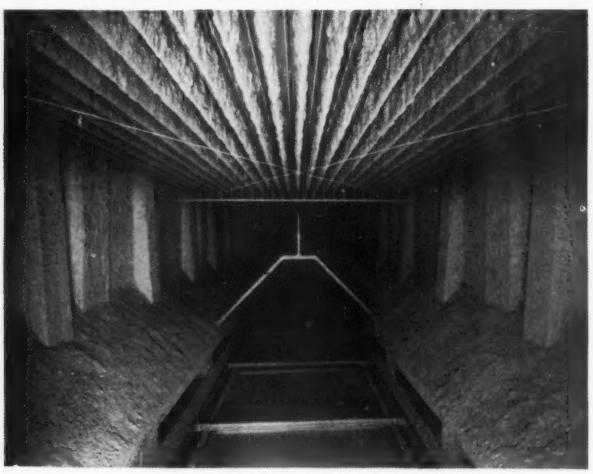


Fig. 13—Treater chamber. Electrical plate treater. Suspended grid. Rectangular openings admitting gases. Scraper conveyor. Electrode wires. Plates covered with potash salts. Air hammer

Electrical Treater

The final step in the recovery system involves the electrical treater (Fig. 13). This constitutes a type of plate treater differing from the usual type of pipe treater operated by cement plants. The latter type has been experimented with by this company, after which it was dismantled in favor of the present plate type.

The treater chamber, housing the plate treater, is 34 ft. x 13 ft. On each of the longer sides of the chambers and 2 ft. from the floor, which separates this from the dust chambers underneath, are horizontal bench projections 3 ft. wide, which prevent the light, white, flocculent, precipitated salts discharged by the treater above from passing through the openings and mixing with the dry dust underneath; underneath these projections are the rectangular openings through which the gases are admitted into the treater chamber. A scraper conveyor on this floor moves the discharged salts to and through the exit end of the chamber.

The treater is 30 ft. x 12 ft. and the plates, which are 6 in. apart, 18 in. high, extending over the entire linear length of 30 ft., are riveted to angle irons and the whole supported by cross beams above the treater. Spacing between each row of angle irons effects a uniform distribution of the gases and allows the treated gases to pass through to the fans (Fig. 15) and to the atmosphere.

In providing for a large treater area a correspondingly large electrical field is maintained through which the gases must pass, and simultaneously the gas velocity is reduced to 1 ft. per second, permitting the discharged salts to drop freely to the floor in the gas current.

The electrode wires between the plates, two of each and 8 in. apart, are suspended horizontally and taut between bus-bars rigidly supported by insulators at each end of the chamber.

Midway between the linear ends of the wires, a light grid, through which each wire is threaded in accurate spacing, is braced by diagonal wires attached to the bus-bars, and the whole suspended to eliminate any oscillating movement of the collected wire installation.

For removing the salts on the wires a light air hammer, mounted on a pipe frame underneath the grid and operated for a few seconds at hour intervals by compressed air, transmits light blows to the grid, setting up a vibration in the wires which effects a subsequent rejection of the salts. When not in operation the hammer automatically withdraws to avoid arcing.

The treater operates under a current of from 40,000 to 50,000 volts, supported by motor generator sets, rectifiers and accessory equipment (Fig. 14).

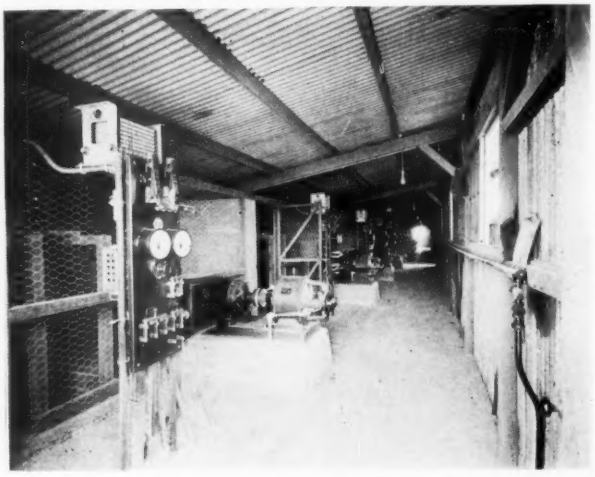


Fig. 14—Motor generator sets. Rectifiers. Electrical equipment. Air valves for controlling air hammer

Owing to the light weight of the discharged salts, approximately 10 lb. per cu. ft., and the difficulty in loading cars to capacity, the recovered salts from each unit as they pass through each chamber

exit are discharged into a set of slowly revolving rolls (see Fig. 16), which remove the entrained air and compress the salts one-fourth, effecting a change in weight to approximately 50 lb. per cu. ft. The final salts are discharged directly into sacks which are then weighed and transferred to storage or cars.

The recovery efficiency in the treater

Fig. 15—Fan motor room

varies from 75 to 80 per cent, and the tonnage production of salts from each kiln per 24 hours ranges from 2,000 to 2,400 lb. Ten recovery units have a daily production of from 10 to 12 tons of salts in the form of sulphates.

Each recovery unit consumes 40 hp., one-half of which is consumed by the motor-generator set for the electrical treater.

The salts are remarkably uniform and afford the following by analysis:

	Pct.
Potassium Oxide (K_2O)	32.59
Sodium Oxide (Na_2O)	8.36
Iron, Alumina and Silica (Insoluble)	5.22
Sulphur Trioxide (SO_3)	40.19
Chloine (Cl)	.49
Calcium Oxide (CaO)	10.79
Water (H_2O)	.49
Borax ($Na_2B_4O_7$)	None
Volatiles (CO_2 etc. by Diff.)	1.87

Fire-Resisting Properties of Gypsum

FROM the Gypsum Industries Association, Chicago, Rock Products has received a copy of the "Digest of Fire Tests of Building Columns," prepared by George H. Graves, consulting engineer.

The Digest is being distributed for the purpose of showing the remarkable results obtained by the use of gypsum tile for fire protection of steel columns. It has been prepared from the original report made by the Underwriters Laboratories, Inc., and has also been published by the Bureau of Standards as Technologic Paper No. 184.

This digest is published by the association and will be sent to those who may desire to apply its conclusions to their work.

Lignite Briquets for Lime Kilns

CRUDE lignite is a fuel difficult to handle, and the great percentage of water (as much as 50 per cent) causes slow combustion and burdens the fuel with a considerable percentage of dead weight.

For this reason endeavors were made to briquet the material, thus economizing transport, facilitating preservation, and handling.

The average composition of a briquet is: Carbon, 55 per cent; water, 13 per cent; ash, 6 per cent; combustible foreign matter, 26 per cent; average calorific power, 4,800 calories.

Fig. 16—Revolving rolls

Lignite briquets contain a great proportion of gas, and in burning give off about 57 per cent of their weight; nearly all of this gas is fuel. Consequently the maximum thermic efficiency is obtained in kilns, with long passages for the gas.

Lignite briquets can be profitably employed in the building materials industry, especially for lime kilns.

The calorific pressure seems to be increased in practice by combustion of the gases from the limestone or from the lignite.

It must also be noted that the production of large quantities of volatile matter favors decomposition of the lime carbonate. The molecules of CO_2 produced are carried away in the gaseous current, and the equilibrium $CO_2\,Ca$——$Ca\,O$—CO_2 cannot occur. This well-known phenomenon of dissociation tends to slightly decrease the requisite temperature for lime burning, hence a small economy of fuel. Another appreciable advantage in the lime industry is that lignite briquets only give a very fine ash in burning, which, when mixed with lime, is free from the inconveniences caused by the cinders from the kind of coal usually employed.

A briquet, broken into pieces, has a complete combustion similar to that of coal dust, which hitherto it has not been possible to economically utilize in kilns.

Combustion in a gas producer of these briquets has given excellent results for furnaces of iron and steel works, and their use is to be recommended for cement kilns and glass making.

Briquet gas, weight equal, is richer in combustible products than coal gas; consequently transformation into gas is operated with a very small amount of air. Regularity in form and composition of the briquet favors good working of gas producers, in which the want of uniformity of ordinary coal has often caused defects.

It has been objected that the storage of lignite is dangerous, as it may ignite spontaneously. The danger is no greater than with other fuels, provided the following precautions are taken:

1. Avoid all cause of heat from the exterior.

2. Reduce dust and small bits to a minimum in storage, as they ignite most readily.

3. Stack the briquet on a dry floor, in stacks less than 9 ft. high, leaving spaces for ventilation.

Thus the employment of lignite briquets in the lime industry is really profitable, having the advantages of cheapness, convenient handling, uniform composition and regular combustion. At a time when coal is expensive and often of poor quality, such advantages deserve the attention of lime burners and manufacturers of building materials, in the cost price of which fuel is such an important item.—*Rev. Mat. Construction.*

Material Handling in the Sand-Lime Brick Plant*

Labor-Saving Methods and Hints That Have Broad Application in All of the Rock Products Industries

By W. A. Buell and F. E. Smith
Barber-Greene Co., Aurora, Ill.

WHILE THE BASIC REASON for introducing any labor-saving machinery is the reduction in operating expense and the consequent increase in profits, the factor which first focuses the attention of a manager or superintendent on any particular phase of his work and brings to him a realization of the need for labor-saving machinery is frequently not directly related to the daily payroll. It may be the need for increased production without increase in the size of the plant. It may be trouble with a certain floating labor element. It may be the desire to provide storage of certain materials in order to get away from the old hand-to-mouth methods with their consequent costly delays.

On the other hand, the manager or superintendent may be forced to acknowledge that his costs are somewhere out of line. He will then have to conduct an investigation of his methods, find the trouble, and remedy it. In such an investigation it is well to examine first the operation involving the largest payroll. Where the year's total is large, a saving of even a small percentage will be appreciable.

For illustration, assume that there are two operations in a plant; one involving a yearly payroll amounting to $1,000, the other amounting to a yearly payroll of $50,000. It would hardly be wise to spend much time investigating the $1,000 work until cutting the cost of the $50,000 work has been effected or proved inexpedient. To cut this cost of $50,000 by 5 per cent would be a much greater saving than to eliminate the whole of the $1,000 item.

Further along this line, it is well to bear in mind that while the installation of a certain combination of machines may show a very appreciable saving, it may still be possible that the installation of only 25 per cent of the equipment under consideration will result in 75 per cent of the total possible saving. If this is found to be the case, it may be wiser to invest the 25 per cent and apply the remaining 75 per cent to better advantage elsewhere in the plant.

Factors in the Selection of Machinery

Having decided that the installation of labor-saving machinery at some point in the plant is advisable, the next step is to make a study of this in dollars and cents. It is true that certain assumptions have to be made and the correctness of the results depends very much upon the judgment of the man making the investigation. Granting, however, that the assumptions and judgments are correct, it is possible to work out the cost under different methods with exactness.

In the choosing of the proper equipment to handle any given work, it is possible to make cost analyses of various methods with about the same degree of accuracy as you are able to figure the cost per thousand of your brick.

Pit Equipment

We shall now have to leave the more general discussion of labor-saving equipment and enter the more specialized field of handling the sand from the bank or pit to the plant. The first operation is, of course, the loading of the sand into some manner of conveyance which will move it to the plant. If the pit is near enough to the plant so that the sand may be moved by cable-drawn cars or conveyors, the operation of digging and moving to the plant may very well be considered as a single operation. There would, of course, be two parts; namely, the digging machine and the conveying equipment, but these would have to be studied together since they must be used together. If, on the other hand, the material is moved on barges, railroad cars, trucks, or other equipment for rather long distances, the two operations may be very well separated.

Let us consider, first, the machine for digging the sand and loading it without reference to the method of further conveying to the plant. The type of machine is governed largely by the capacity needed. In the digging of a drainage ditch, an excavator can be chosen of any capacity whatever; and it usually follows that the cost per yard of handling decreases as the size of the machine increases. In the handling of sand for a sand-lime brick plant, however, the yardage to be handled per day is very definitely established by the size of the plant and the use of a machine of too great capacity is immediately reflected in high cost per cubic yard. The cost analysis should catch this and automatically indicate the right machine.

Depreciation and Other Overhead Allowances

The question of the proper overhead to be charged against various types of machines has received a great deal of study by the Associated General Contractors of America. The economic life is taken to be the number of years of service to be expected before the value of the machine drops to 25 per cent of its original cost. This cost is, of course, the cost in place and operating at the owner's plant. The depreciation, then, is 75 per cent of the original cost divided by the number of years assumed as the economical life.

There is no doubt that it will frequently pay to maintain and operate equipment which has dropped in value to a point far below 25 per cent of its original value. The repair bill is the best criterion. Some equipment, especially that which is not portable but built to remain permanently in one position, may be used with economy but would be only junk if taken down. In figuring on new fachinery, however, we feel that the contractors' method is fair.

The interest at 6½ per cent is likewise taken as 6½ per cent of the average value $\left(\frac{(100\%+25\%}{2}\text{ or } 62\tfrac{1}{2}\%\right)$ or approximately 4 per cent of the original cost. With this explanation, one should be able to use the A. G. C. table* in making any cost analysis of this kind. We have little criticism of this table as regards the comparing of various types of equipment. We do feel, however, that the overhead expressed here is severely high for this equipment when used by a manufacturing plant and, consequently, if these figures are used in comparing machine methods with hand methods, the result will be unduly favorable to hand methods. It is commonly acknowledged that contractors

*A paper read at the annual convention of the Sand-Lime Brick Association, Dayton, Ohio, April 26, 1921.

A portion of this table was published in Rock Products, May 21, 1921, page 26.

use their machines more unmercifully and wear them out more rapidly than do any other users. For example, we know that a great many of our portable belt conveyors have been used for four years and are still in very good condition. Conversely, we do not know of any portable conveyor receiving even a small amount of attention which has worn out in two years.

It is not expected that I can work out a general solution which you can apply to your own pit, but I can, perhaps, strike a simple comparison of three possible methods and the same principle can be applied to any other methods of operation under consideration. Let us consider a drag line, a power shovel and a bucket loader. In order to compare these on the same basis, let us consider each one driven by gasoline engine.

Equipment	Original Cost Installed	Annual Overhead Per Cent	Annual Overhead in Dollars
Gasoline dragline	$ 7,000	44¼	$3,132.50
Gasoline power shovel	12,000	40¾	4,890.00
Gasoline bucket loader	4,000	37	1,480.00

Let us further assume that the plant uses about 25,000 cu. yd. of sand per year. We then have an overhead in each case as shown below:

Equipment	Total Annual Overhead	Cu. Yds. Handled Per Yr.	Overhead Per Cu. Yd., Cents
Gasoline dragline	$3,132.50	25,000	12.53
Gasoline power shovel	4,890.00	25,000	19.56
Gasoline bucket loader	1,480.00	25,000	5.92

Assuming that the conditions are such that any one of the three machines would satisfactorily operate, it would appear that, on the basis of overhead and repairs, the bucket loader would be the proper machine for this amount of yardage per day. It is, of course, true that the same ratio expressed in percentage is maintained as the yardage per day is increased, but the overhead per cubic yard becomes so small that it is not as important as other items which enter into the total cost per cubic yard.

Other Cost Considerations

To the overhead per cubic yard must be added the power and labor per cubic yard. Up to this point we have considered the digging machine as an isolated unit. In figuring the power and labor, however, we must take into account the conveyance which is to carry this material to the plant. Let us assume that the 25,000 cu. yd. represent 250 days' work of 100 cu. yd. per day. Let us assume that any particular machine under consideration has a capacity of 50 cu. yd. per hour. If the equipment which carries the material from the digging machine to the plant has the same or a greater capacity, the daily operating charge against the digging machine will be two hours' time for the operators, plus the fuel and oil required for two hours' work at full capacity.

If, on the other hand, the equipment which carries the material from the digging machine to the plant is capable of handling only 10 cu. yd. per hour, we then have to charge against the digging machine the labor for 10 hours' work and fuel and oil for two hours' work at full capacity, or 10 hours' work at one-fifth capacity, depending upon the conditions. For convenience, let us assume that any one of the three machines in question is permitted to work at full capacity and that the time required, including oiling and minor repairs not covered in the overhead, is three hours per day.

Let us assume that one operator and one helper are required to operate the shovel at $1 and 50c. per hour, respectively; that one operator at 75c. is required to operate the dragline; that one operator at 75c. is required to operate the bucket loader. Let us assume that the gasoline required for the shovel and dragline is about 2 gal. per hour each, and for the bucket loader 1 gal. per hour, at 30c. per gal., the actual operating time being two hours per day. We then have as operating expenses the following:

EQUIPMENT	LABOR COST PER DAY	POWER COST PER DAY	TOTAL OPERATING COST PER DAY	OPERATING COST PER CU. YD.
Gasoline dragline	$2.25	$1.20	$3.45	3.45c
Gasoline power shovel	4.50	1.20	5.70	5.7
Gasoline bucket loader	2.25	.60	2.85	2.85

The total costs, then, are as follows:

EQUIPMENT	OVERHEAD PER CU. YD.	OPERATING EXPENSE PER CU. YD.	TOTAL COST PER CU. YD.
Gasoline dragline	12.53c	3.45c	15.98c
Gasoline power shovel	19.56	5.70	25.26
Gasoline bucket loader	5.92	2.85	8.77

It is apparent that a power shovel costing $12,000 and requiring two men to operate it would not be an economical purchase for the handling of such a small quantity of material per day. These figures and the resulting conclusion should not be taken to apply to all cases in general or to any one specific case, since the figures were merely chosen at random to constitute a hypothetical case.

In this class of work, and in the handling of this quantity of material, if the conditions are such that the bucket loader can be used to advantage, we believe that it will always prove to be the most economical.

We have not mentioned the figuring of costs of hand loading. This is very easily figured, being mainly payroll with a certain amount of superintendence and a small amount for tools. We frequently forget to even mention the hand labor since we find all over the country a disinclination to even compare hand labor with machine methods, the only question being which particular machine method to employ.

Conveyors with Different Excavators

In choosing the digging machine, the method of conveying from the pit to the plant must be considered. The dragline digs the material at different points, but always discharging at the some point. This makes it possible to load into practically any kind of conveyance. If the discharge is at a point below the road or railroad track, it may discharge into a hopper which in turn feeds to a permanently inclined conveyor, which in turn discharges into the conveyance for transportation to the plant, or to a series of conveyors which carries the sand to the plant.

The power shovel will work conveniently with practically any conveyance except a conveyor. Portable conveyors could always be kept in attendance, but it would be further necessary to provide a large and substantial hopper to receive the material from the shovel and feed it to the conveyor. This is a troublesome feature. It is doubtful whether it is more troublesome, however, than to maintain a roadway, railroad, or narrow-gage industrial track always in proximity to the shovel. In larger work and in material other than sand, the shovel has a field all its own.

The bucket loader does not have the radius of discharge which the shovel has. It consequently cannot conveniently discharge into cars which have to be kept on a track. It can easily discharge into motor trucks, or any vehicle which can be brought to it. This, however, means maintaining a road. The more common method is to discharge to a portable conveyor. This conveyor can discharge into cars on a track, any vehicle operating on traction wheels, or to a series of conveyors, which will discharge at the plant.

The combination of the two machines gives the radius of the power shovel. The discharge from the bucket loader is ideal for use with conveyors. The material is discharged in a steady, small stream. No feeding hopper is required. This is the combination which you will see or have seen in operation at this plant (Crume Brick Co.). In this connection, it is interesting to note that Mr. Crume wrote us some time ago as follows: "The feature of being able to operate the machine at all times, and with a sufficient capacity to fill up our sand storage in a short time, would make it worth while, even though the cost per yard should show no particular saving over that of hand labor."

This is another reference to the indirect but powerful factors which should

not be lost sight of in planning your equipment.

Life of Conveyor Belts

In this same letter, Mr. Crume states: "A good grade of canvas belting with a fair amount of attention gives us from two to three years of service. In fact, about 500 ft. of canvas belting which we are still using on our conveyor is now entering its fourth year of service. We are now using a high grade of rubber belting in place of the canvas belting, and expect to get even better results."

We mention this to show that the economic life of a conveyor is much longer than the two years which is noted in the Associated General Contractors' tabulation. It has been our experience that rubber belting on portable conveyors, receiving rather hard usage lasts from two to three years. It would be a very poor machine that could not wear out two rubber belts. It should outwear several. Since our equipment has been on the market only four years we are unable to give even an intelligent estimate regarding the life.

We are frequently asked, "What is the maximum distance that material may be moved economically on conveyors?" It is, of course, governed by the conditions; a cost analysis alone can determine it in each case. In a Pennsylvania coal mine it has been planned to install 4½ miles of conveyors, probably 4 ft. wide, to carry 15,000 tons of coal per day to the mouth of the mine. The cost of installation will be about $4,500,000.

In small plants handling roughly from 20 to 50 cu. yd. of sand per day, a portable belt conveyor would doubtless be a much better investment than any more expensive equipment. This means, of course, more labor and less overhead. A conveyor of the right design can be loaded without a great deal of shoveling. The loading end can be kept against a rather vertical face. Material is then raked down to the belt without being shoveled. Practically any kind of vehicle can be loaded in this manner. The length would vary according to conditions between 18 and 45 ft. The short conveyor would be a one-man machine, while two or three men might be economically used with the longer one.

If the sand is conveyed to the plant by conveyors only, the matter of handling at the plant is automatically taken care of. If the sand is otherwise conveyed to the plant, there may be the problem of unloading the conveyance, placing in temporary storage or delivering to the mill. If any temporary storage is carried, there is likewise a problem of moving the material from this storage to the mill. Conditions vary so that it is out of the question to recommend any general layout. The use of permanent conveyors is not new, but the portable conveyor has been made on a commercial scale only during the past four years. Its use, therefore, is not as widely known as it should be. I will suggest a few uses or methods in a sketchy fashion.

Various Uses for Portable Conveyors

If the material is in standard railroad cars, it may be dumped directly into the hopper of a conveyor, which conveyor will usually carry directly to the mill or storage hopper. With the aid of one or more portable conveyors, a storage pile may be built which may later be moved back into the plant with the same portable conveyors. If the material is handled without the aid of a pit underneath the railroad track, there will be some clean-up by hand. In such a permanent installation as yours would be, it would be wise to install a shallow pit underneath the track which would save this handwork.

Any kind of industrial car is arranged to dump in one manner or another. It can be very easily arranged to discharge to a conveyor which will take the sand wherever needed. If the sand is received in motor trucks or other vehicles not running on rails, they may also be dumped directly into the hopper of a conveyor with the same results.

If the sand is received by barge, a portable conveyor can be used, operating directly on the flat deck of the barge as soon as space is cleared to accommodate it. In the case of small barges, the wheels of the conveyor are kept on the dock, while the loading end extends to the barge and is moved as the work of unloading progresses. In the case of large deck barges, the bucket loader could be used to good advantage, discharging to a conveyor.

Lime may also be handled from the railroad cars in the same manner, and for at least part of its journey it could travel over the same conveyor as the sand, in case the sand is delivered by rail.

Coal as well as other bulk material can be unloaded and moved under almost any conditions, satisfying practically any requirements.

Combination of bucket loader and portable belt conveyor in use at the Crume Brick Co.'s plant, Dayton, Ohio

Boost for Concrete Brick

VARIOUS KINDS of concrete bricks designed and manufactured to compete with the clay bricks used extensively in the building industries of New York City have been tested at the laboratories of the Department of Civil Engineering, Columbia University, it is stated by Professor Albin H. Beyer, director of testing.

The manufacturing processes and the quality of these new kinds of brick have already reached the stage of active competition with the better grades of clay bricks.

In co-operation with the Bureau of Buildings of New York city, an extensive investigation is now being carried on at the university, with the view of determining the comparative strength of similar masonry structures built with concrete and clay bricks. The tests completed to date indicate that the ratio of the average strength of brick masonry to the average strength of the individual brick composing this masonry varies widely with the kind of material of which the brick is made. This strength or efficiency ratio seems to greatly favor the concrete brick, which, with the mortar forms a more homogeneous monolith than the various kinds of clay bricks now used.—*New York Journal of Commerce.*

Missouri Valley Sand Producers Hold Annual Meeting

Much Progress Shown in Spite of Many Handicaps

PRODUCTION of sand and gravel in the western half of Missouri, in Kansas and Oklahoma during 1921 averaged from 50 to 75 per cent of the 1920 production, according to statements made by members of the Missouri Valley Sand and Gravel Producers' Association at the annual meeting held in Kansas City, Mo., December 6 and 7. Conditions were best in Oklahoma and the improvement there was directly traceable to the fact that the State Railroad Commission prevented the 35 per cent increase in freight rates from becoming effective. If freight rates are reduced before another season, operators look for the busiest and best season yet.

The year of 1921 was a period of acid test for the association, but it came through with colors flying under the able leadership of John Prince, president of the Stewart Sand Co., Kansas City. The association was assailed from every angle, both within and without, but owing to the splendid spirit of toleration and understanding developed in three years of mutual acquaintance and goodfellowship, the members left the annual meeting with renewed faith in the organization and in each other.

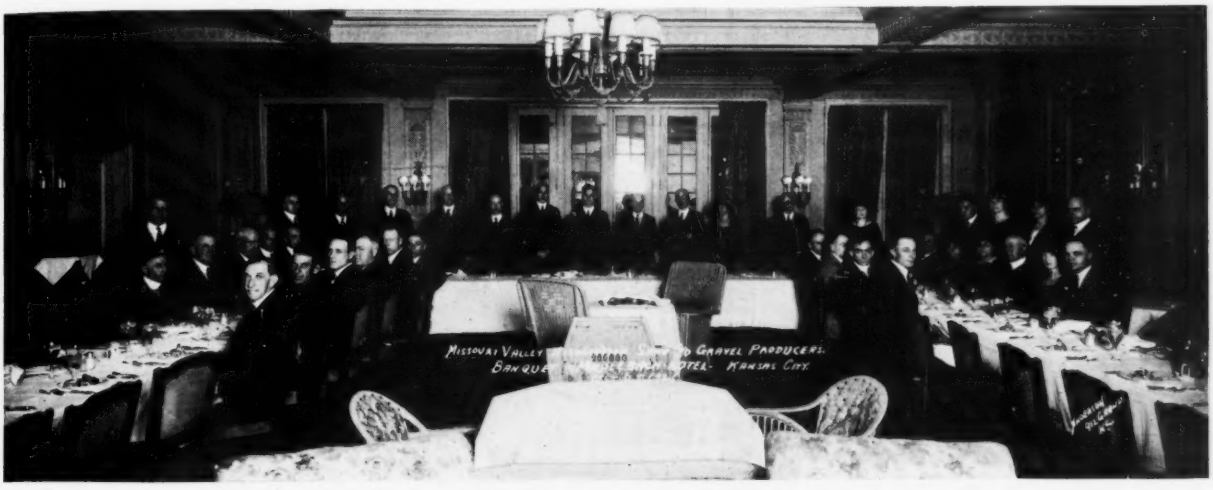
After having engineered the association from its beginning, John Prince retired as president in favor of J. M. Chandler of Tulsa, Okla. Mr. Chandler is one of the largest producers of both sand and crushed stone in this district and is a prominent business man as well. He is president of the Price Sand Co. and the Hughes Stone Co. The newly elected vice-president is Harry E. Moore, president of the Missouri River Sand and Gravel Co., Boonville, Mo. The new treasurer is R. H. Cubbon, of the Jackson-Walker Coal and Mining Co., Wichita, Kan. W. E. Johnson, acting secretary for several months past, was appointed secretary with offices in the Minor Building, Kansas City, Mo. Former Secretary Laughead is now one of the owners of the Topeka Sand Co., Topeka.

Will Continue Price Reporting

In the annual report of the retiring president, John Prince, he reviewed briefly the history of the organization, laying particular stress on the attack the organization has weathered on account of its operations under the "open-price" policy. In a recent investigation of labor and building material conditions in Kansas City John Prince and Frank W. Peck, treasurer of the association, were both grilled on the operations of the price-reporting feature of the organization. Both took the stand that the practice and the prices were defensible, fair, honorable and legal.

They put all the cards on the table, opened their books, admitted exchanging quotations, admitted quoting the same prices, gave good and sound reasons therefor; and they were given a clean bill by the the attorney general of the State of Missouri, whose representative attended the hearings. The published statement of the attorney general, after hearing all sides, followed very much the same line of reasoning as the subsequent decision of Judge Carpenter in the famous linseed oil case (ROCK PRODUCTS, November 19).

Judge Carpenter's decision was discussed at the meeting and it was voted to continue the open-price policy as heretofore.



Annual dinner of the Missouri Valley Sand and Gravel Producers' Association at Kansas City, Mo., on December 8

W. E. Johnson, Secretary of the Missouri Valley Sand and Gravel Producers' Association

"Experience Meeting"

The session on Tuesday morning was a splendid exhibition of what an association of this kind should always stand for. The president called for reports from representatives of the five producing districts of the association—Lower Kaw River, Upper Kaw, Missouri River, Arkansas River and the State of Oklahoma. Each producer got on his feet and stated frankly and honestly what was on his mind. Consequently there was a meeting of minds and an understanding which will go a long way to prevent conditions which lead to disaster in the industry and in the end to the public.

It was disclosed, as is always the case when producers get together in a frank discussion, that many do not know what their costs actually are. One of the most enlightening features of the discussion was the presentation of a series of cost reports compiled by the secretary of the association from the books of the producers themselves. Mr. Johnson had visited each producer and had been given access to their books. From these he compiled average costs and average selling prices for each of the five districts in the association, and for the entire territory.

Mr. Johnson is an expert accountant and after making proper allowances for depreciation, reserve and operating expenses often overlooked he found the actual cost of producing sand, averaged for the entire territory covered, was 68.4 cents per ton; while the average selling price in 1921 has been only 69.9 cents per ton. With these figures there certainly could not be found any evidence of excess profits.

All the producers in this district are almost exclusively sand producers, so that the operations—all pumping propositions—are comparable. The allowance for depreciation reserve must be high because all the operations are on streams notorious for their sudden and unexpected tricks; and it has been proved by many sad experiences that entire plants are subject to entire obliteration within the space of a few minutes.

This point was strongly emphasized in a discussion of the possibilities of a mutual marine insurance company. Old line companies, if they accept such risks at all, charge 20 per cent or more of the value of the plant as an annual premium. As the total value of sand produced annually seldom equals the value of the invested capital, it can be readily understood why a fairly large proportion of the cost of producing sand is justifiably charged to depreciation reserve, where plants carry no marine insurance. It was shown that while a producing company might pay dividends out of this reserve, it was not as a matter of fact earning a real profit.

National Association Officers Guests

V. O. Johnston, president, and E. Guy Sutton, secretary, of the National Association of Sand and Gravel Producers were guests of the convention on the second day. They described the progress made in the industry during the last year and explained in detail the nature of their fight against the railways for a reduction of freight rates.

Mr. Johnston made a splendid address on what the organization of the industry had accomplished and paid the Missouri Valley Association the highest compliments for its share in the general uplift of the industry.

As usual, the Kansas City producers were more than liberal in the way of entertainment.

Western Sand and Gravel Men Endorse Freight Rate Fight

Kansas City Meeting Puts Shippers in Western Territory Behind National Association's Fight

FOLLOWING the annual meeting of the Missouri Valley Sand and Gravel Producers Association at Kansas City, Mo., on December 8, was a general conference of representative shippers from the Western Freight Association Territory. Producers were present from St. Louis, Omaha, and many intermediate points.

President V. O. Johnston and Secretary E. Guy Sutton of the National Association of Sand and Gravel Producers were present and explained the Interstate Commerce Commission petitions in detail. The first of the hearings granted the producers of sand and gravel on these petitions will be heard in Washington, D. C., on January 16. This will involve the rates in the Central Freight Traffic Association Territory.

It is generally believed that this will be a test case, and if it is won by the producers—as it must be if they give the case proper support—the railways will not seriously contest the cases in the other railway freight association territories. However, the National Association is going ahead and making every preparation to try the cases in all the territories.

The action of the National Association in bringing about the Interstate Commerce Commission investigation of the rates was heartily endorsed. It was made clear that any change in the basis of rates was not contemplated and would be unanimously opposed. The shortcomings of a mileage scale of rates were clearly shown.

The deliberations of the conference were crystallized by the unanimous adoption of the following resolution, presented by Mr. Taylor, of the Missouri Portland Cement Co., St. Louis, Mo.:

WHEREAS, the National Association of Sand and Gravel Producers has filed a complaint with the Interstate Commerce Commission attacking the existing interstate level of rates on sand, gravel and crushed stone in the states west of the Mississippi River.

NOW THEREFORE BE IT RESOLVED, by producers with plants located in said territory, in conference assembled:

1. THAT the National Association proceed with the prosecution of the complaint having for its purpose to seek a general reduction in interstate rates on sand, gravel and crushed stone between points in the states mentioned in the complaint, in the form of a removal of the increases authorized by General Order 28 and Ex Parte 74, and substituting only such advances as may be necessary to bring these rates to a proper level of reasonable rates.
2. THAT in order to facilitate the handling of the case before the Interstate Commerce Commission and to develop evidence satisfactory to the producers concerned, the Freight Rate Committee of the National Association be supplemented by one representative to be selected from State of Minnesota, Nebraska, Iowa, Eastern Missouri, Kansas and Western Missouri, Oklahoma and one from each of such other states or districts as may indicate an interest in the case.

Farmers Using More Lime

PENNSYLVANIA agricultural officials state that there has been a return to the use of lime in that state. The war interrupted shipments of potash and other fertilizing ingredients and has as a consequence forced a more extensive use of lime and similar materials than in many years.

Illinois Concrete Aggregate Association Meeting

Enthusiasm and Willingness to Participate in Discussions Mark Annual Meeting—Good Prospects Ahead for 1922

ENTHUSIASM, good cheer, industry and a willingness to participate in all discussions dominated the annual meeting of the Illinois Concrete Aggregate Association held in Chicago on December 13. Practically 95 per cent of the entire membership was present.

The principal address of the day was given by Frank T. Sheets, superintendent of the division of highways of Illinois. Mr. Sheets gave a very interesting talk, outlining the work of the highway department during the past year and its expectations for 1922. The department intends to complete 1000 miles of hard roads in Illinois by the end of 1922, unless unforeseen things happen which would retard the work.

Mr. Sheets expressed the fear that the Illinois producers would not be able to supply the material which will be needed for this work. For instance, it would take a train of freight cars 1000 miles long to handle all the aggregate needed, or 7000 miles of freight cars, including empties, those being loaded and those under way. To build the 1000 miles of hard road it will require 3,000,000 bbl. of cement, 1,600,000 tons of fine sand and gravel, and 2,800,000 tons of coarse aggregate, making a total of 4,400,000 tons of aggregate. The Illinois Concrete Aggregate Association has a production of 2,500,000 tons, and this means that every means of co-operation will be needed to meet the demand for material.

The general plan is to so distribute the material required that all highway undertakings in the state will be uniformly supplied, rather than allowing the material to become congested at certain points at the expense of others equally in need of material.

Much credit is due the Association for its good work in urging both state and county road officials to let contracts for road work in fall rather than hold it over until the spring.

A workers' compensation and insurance plan was adopted whereby the Association, by placing its insurance in one company, secures reduced rates and the privilege of individual inspection of plants and safety devices.

The Association adopted a credit plan that will enable each member to get a full report from other members as to doubtful customers and information from company ledgers that cannot be obtained from either *Dun's* or *Bradstreet's*.

In his report, Secretary Pierce explained the educational work conducted the past year to teach the taxpayer the need for clean material in constructing and maintaining the highways.

The newly elected officers for the coming year are: President, Burton H. Atwood, the Interstate Sand and Gravel Co., Chicago; vice-president, George P. Longwell, the Consumers Co., Chicago; treasurer, J. C. Brault, the Lincoln Sand and Gravel Co., Lincoln. Secretary J. D. Pierce continues in office as his term does not expire until the spring.

President Burton H. Atwood

A change in the by-laws was made so that the executive committee may be elected for three years—one for one year, one for two years and one for three years. The committee is as follows: For one year, W. G. Van Etten, H. D. Conkey Co., Mendota; for two years, Joseph C. Aldous, Mississippi Lime and Materials Co., Alton, and for three years, S. A. Gibson, Rockford Sand and Gravel Co., Rockford.

National Crushed Stone Convention

AS MENTIONED elsewhere, the National Crushed Stone Convention will be held in Chicago, Ill., Monday, Tuesday and Wednesday, Jan. 16, 17, 18, 1922.

The American Road Builders' Association Convention and Road Show will be held the same week, Jan. 17 to 20. Quarrymen from nearly every state in the Union and Provinces of Canada will attend.

General sessions will be held in the East Room of the La Salle Hotel; the banquet Tuesday evening, Jan. 17, in the Red Room. Col. A. J. Sullivan, treasurer of the National Crushed Stone Association, has made reservations for 50 rooms at the La Salle Hotel for convention week. Write or wire him at once. Mr. Sullivan's address is: Col. A. J. Sullivan, Inland Crushed Stone Co., 139 North Clark street, Chicago, Ill.

Illinois Association of Highway and Municipal Contractors' Meeting

THE Illinois Association of Highway and Municipal Contractors will hold its fifteenth annual meeting at the Hotel La Salle on Monday, January 16, 1922. The Association meeting will begin at 10 o'clock a.m. in Room 1811 and the open meeting will be held at 2 p.m. in the Red Room. A banquet and entertainment will be given in the Red Room at 6:30 in the evening.

Annual Meeting of Agricultural Engineers

THE fifteenth annual meeting of the American Society of Agricultural Engineers will be held at the Auditorium Hotel, Chicago, on December 27-29. The second day will be devoted to recent investigational and research developments. The society extends an invitation to all who are in any way interested in agricultural engineering.

Accident Prevention

Fire Causes and Prevention

No. 4—Prepared by the Engineering Department of the National Safety Council

IN PRACTICALLY all industrial plants will be found various types of forges, furnaces, ovens, kilns, retorts and the like which are heated by gas, oil, coal or wood, and frequently by electricity or steam. Certain fundamental principles are important to guard against fire in the use of such apparatus:

(a) It should not be installed near woodwork or other inflammable material.

(b) Where gases and liquids are used for fuel, pipes instead of tubing should be used for piping the fuel. The piping (for liquids) should be so arranged that the fuel will drain to the supply tank in case of a break in the pipe.

(c) A dependable shut-off valve should be located at a safe distance from the furnace.

(d) Where wood, coal or coke is used for the fuel, care is necessary in the disposal of the ashes.

(e) For electrically heated apparatus, a light indicating when the current is on is advisable.

Gases

Location of Fixtures—Movable gas jets are specially inadvisable because they may be swung against curtains or woodwork and ignite them; stationary fixtures are therefore recommended. If moveable fixtures are used, suitable stops should be provided to prevent the fixture from being swung against inflammable material.

Connections—The use of rubber tubing on connections to gas heaters, stoves, furnaces and other such equipment is not advisable. Tubing deteriorates with age, dries out and cracks so that a leak is apt to develop. The tubing may also be pulled from the connection at either end, creating the possibility of a fire or of asphyxiation of persons present. Where it is necessary that tubing be used, it should be of the best quality and should be securely fastened to fittings at both ends. Flexible metal-covered tubing is preferable. A shut-off valve should be provided only on the gas supply pipe so that no gas will be left in the tubing when valve is closed.

Leaks in piping and fixtures are also likely to cause fire or explosion and it is therefore important that such fixtures be installed only by competent workmen. Leaks, of course, should not be looked for with a lighted match or other open flames; gas-proof electric pocket flash lamps are desirable.

Every gas supply main should have an efficient shut-off valve, outside of the building, and easily accessible, in case of fire. An automatic shut off is not advisable because it may be desired to have gas available for illuminating purposes even after an accident or fire has resulted.

Oils, Paints and Other Inflammable Liquids—Oils, paints and other inflammable liquids wherever used constitute a very important fire hazard. These substances are more to be feared because of the danger of spontaneous combustion of materials such as rags, waste, burlap and clothing, in which some of the liquids may be absorbed. Vegetable and animal oils are particularly liable to cause spontaneous combustion.

Storage Tanks—Large quantities of fuel oil, gasoline and such liquids should preferably be stored in tanks buried underground. Pits are objectionable because vapors may accumulate in them. The tanks, if above ground, should be enclosed by a retaining wall or an earth embankment, and should be electrically grounded. Each underground storage tank should have a vent pipe extending above the roof and turned down at upper end with screened opening.

Oil House—Where the quantity of oils used is not sufficient to require large storage tanks, oil houses in which several barrels or containers of various oils may be stored are desirable. Oil houses should be placed at some distance from other plant buildings so that, should fire start in the oil house, it will not endanger the other buildings. Oil barrels should not be placed upon wooden floor or wooden racks, but upon a cement floor or else on concrete blocks or brick. Only electric lights with vapor-proof globes should be used for lighting oil houses, and smoking should never be permitted in or near them.

Local Supplies—Local supplies of gasoline, benzine and similar substances should be kept in safety cans which will not leak when inverted. Only a sufficient quantity should be taken into plant buildings to satisfy the daily needs. Metal pans should also be provided in which to set cans containing local supplies of oil, gasoline, benzine, etc., and preferably such local supplies should be stored in a metal cupboard.

(To be continued)

No-Accident Month at Cement Plant

ON THE first of May the Security Cement and Lime Co., Hagerstown, Md., inaugurated a "No-accident Month" campaign in which each foreman made a record in selling safety to his men. Briefly, the plan was to key the men up to the point where the carelessness of one man would bring down the wrath of his fellows for breaking the day's or month's record for carefulness. The employes were eager to keep the score clean.

For instance, daily bulletins were posted carrying lines by the foreman reading like these: "If you must get hurt, wait until next month—and then put it off;" "We can't brag about our top-pieces as ornaments—they are only good for what is in them—let's be careful."

Capital was made of every accident and the victim soon learned to exercise care. When a no-accident month came along—and it did frequently—a letter of appreciation was written to the men by the general manager. The result of this method of preventing accidents has been that some fine records have been made in the Security Co.'s plant.

Editorial Comment

Fair Prices Easily Defended

No producer needs to worry about investigations into the price of his commodity, if he is quoting what his own business sense tells him is a *fair* price. It is doubtful if any court will find anything illegal in the "open-price policy," if the material is being sold at a price that can be defended as fair. The real issue in nearly every such investigation or trial is the moral issue of whether the producers are playing fair with their customers. Today, the customers, too, are equally guilty, and so long as one does not try "to put something over" they will not press the case to endanger their own organizations.

The investigation of sand and gravel prices in Kansas City, Mo., is a good example. Knowing that their prices were fair and defensible, two of the principal producers laid down their cards and said, in substance, to the representative of the attorney general of the state: "This is what we have done, and this is why we have done it; is it or is it not good business?"

Since what these producers had done was to exchange prices and quotations, and thus know accurately what each and every competitor was doing, so saving themselves from disastrous price wars, the almost certain result was an endorsement of the method which prevented such rotten business management. Doubtless it will be so in every case.

"Protecting The Dealer"

Even sand and gravel producers, in some localities, are faced with the problem of "protecting the dealer." The "100 per cent distribution through dealers" movement being actively pushed by dealer organizations is all right in theory, but hard to justify in practice, particularly in the case of a commodity which seldom carries more than a 10 cents per ton net profit for the producer. To compel a road contractor wishing to purchase 1000 cars of sand and gravel to make his purchase through some picayune small-town dealer and pay a commission to this dealer because the road work happens to be in his territory, is absurd on the face of it, and is the surest way to invite the contractor to open his own gravel pit, even at a loss.

The dealer should be protected in so far that the producer should not take his legitimate business away from him. He should be allowed a commission on all sales that he actually makes for the producer, whether the material passes through his yards or not, because he thus saves the producer so much selling expense and overhead. But the method pursued by the cement companies of allowing the dealer a commission on all the material sold in his territory can not be applied to sand, gravel and crushed stone without encouraging an immense amount of new, small competition.

Whether the "100 per cent dealer distribution" of cement is a permanent feature or not is a matter of some doubt in the minds of many producers. The real test will come when the railways and other big purchasers bring their pressure to bear on producers for a return to old-time practices. In the case of portland cement "100 per cent dealer distribution" is probably justifiable on the ground that the commissions are so small that the dealer must get a commission on all to compensate for the narrowness of the margin on the material he actually handles. But if this is a legitimate argument, it is only right that the dealer stick to his alleged small profits on his retail business. It is notorious that many dealers have not passed on to the consumer all the recent price cuts in cement and other building materials, and it is because of such obnoxious local conditions that many a hue and cry about the price of cement or some other building commodity is raised.

While, under the present arrangement, the dealer may be and probably is a necessary element in the distribution of cement, and the cement manufacturer owes him protection, the producer likewise owes a duty to the general public to protect it from the piratical local dealer. What is sauce for the goose is sauce for the gander, and the dealer may do well to remember there are other parties to the bargain besides himself and the producers.

Real Value of Associations

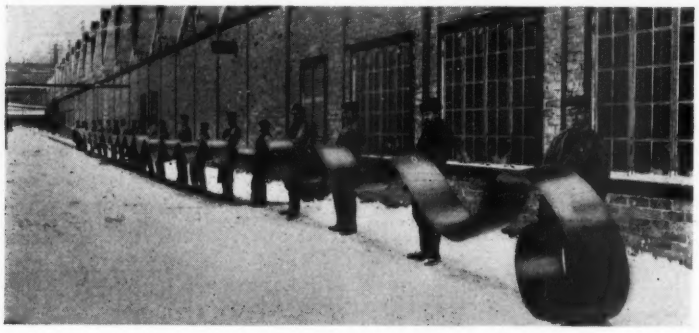
The value of a trade association to competing producers is identically the same as the value of an association of nations, now being fostered by the world's statesmen at Washington. Nine-tenths of the troubles among mankind start from suspicions of the other fellow. There are always some people (or some nations, as the case may be) who for one reason or another profit by keeping these suspicions alive. The way to put such suspicions forever to rest is to air them in an open assemblage of the interested parties. It quickly becomes evident that those suspected have been cherishing similar suspicions about others. The absurdity of the situation is at once apparent; it is soon decided that they are all good fellows and want to do the right thing if they are given a chance.

The more men are brought in contact with their business associates and competitors, the better business men and the better citizens they become. In the last analysis business, politics, government and international relations all have the same human relationships.

New Machinery and Equipment

Steel Belt Conveyor

ABOUT TWELVE YEARS AGO the Sandviken Steel Works, a long established Swedish concern, began making steel belts to be used for conveying purposes, and today it has 1300 installations to its credit. The company is now in a position to meet the demands of the American market. Among its many applications this belt is employed in conveying cement, sand, crushed stone, etc.



This steel belt is 285 ft. long, 16 in. wide and 0.035 in. thick. It weighs about 550 lbs.

The Sandvik belt is made from the best Swedish charcoal steel, cold rolled, hardened and tempered by a special process. Its surface is hard, smooth and dense, giving the belt great durability. When installed as a conveyor with standard size pulleys the belt is subjected to a working stress of from 28,000 to 30,000 lb. per sq. in. when traveling. By special methods of heat treatment, hardening and tempering the Sandvik acquires better rust-resisting qualities than common cold-rolled steel of similar composition.

Compared with flat rubber belts of the same width, the steel belt is said to possess greater transverse rigidity and higher capacity, as the edges, even with a one-sided load, do not yield in a downward direction. This allows a relatively broader bed on the belt to carry the load. The steel belt is less flexible than the textile fabric and therefore two-thirds of the width may be used without danger of spillage—the belt is smooth running.

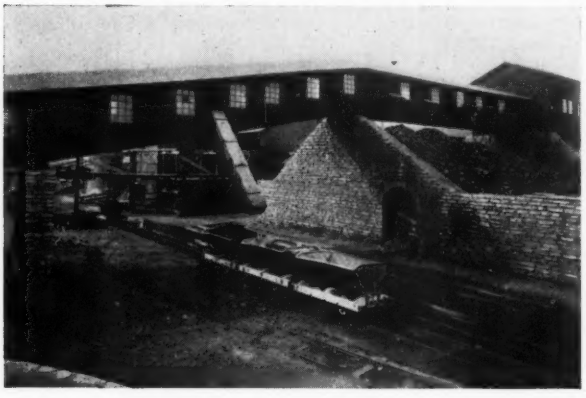
A special feature is the ease and simplicity with which material can be discharged at any desired point along the conveyor without using cumbersome and expensive trippers. The belt does not stretch and the tension devices are therefore simple as they only have to take up trifling length variations caused by changes of temperature.

Sandvik flexible steel belt can be obtained in one-piece lengths up to 300 ft., 16 in. wide and 0.035 in. thick. The lateral deviation does not exceed 0.03 per cent.

The conveyor is designed either with the conveying strand sliding on a wooden support—sometimes fitted with trough-like skirting boards, the return strand being supported on idlers—or else both band strands are carried on rollers. The sliding type, with or without skirting boards—extensively used in Scandinavian countries—has little or no wear even for conveyors of considerable length, as the band surface soon acquires such polish that friction and power consumption are almost negligible.

With heavy, hard and abrasive materials the roller supported type is preferable, the material being placed centrally on the belt and the edges left free, as with flat band conveyors. As steel belts cannot be troughed like textile bands, this is partly compensated for since the flat steel belt has a wider loading area.

The additional advantages of the steel belt have widened the field of usefulness for the belt conveyor, says the Sandvik company, and should be welcomed by those interested in the handling of materials as the ideal system of conveying.



Swedish cement plant equipped with a steel belt conveyor in covered gallery

Interior view of conveyor gallery showing the steel belt conveyor handling limestone

"To Build—and to Serve"

AS the Marion Steam Shovel Co. sees it, the main purpose of trade literature is to "draw a picture" of the company that issues it—to give people who cannot go to the factory an opportunity to "get acquainted."

Undoubtedly, the Marion Company has gone far in its efforts "to draw a picture" of its organization, its factory, its product, in its latest booklet. It is beautifully printed and illustrated, the products interestingly presented, and its story convincingly told. This booklet should be in the files of all who are concerned with shovels, dredges and other kinds of excavating machinery.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.50	per net ton all sizes—Winter prices from stock				
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.00	1.75	1.75	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.15	1.15	1.15	.....
Coldwater, N. Y.			1.50 per net ton, all sizes			
Eastern Penna.	.75	1.60	1.60	1.60	1.60	1.60
Munns, N. Y.	.70	1.15	1.15	1.15	1.15	1.15
Walford, Pa.	1.00	.....	1.60	1.60	1.60	1.60
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.35	1.35	.....
Bettendorf, Ia.			All sizes, 2.00 cu. yd. f.o.b. quarry			
Buffalo, Iowa	1.00	.....	1.50	1.30	1.35	.....
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Faribault, Minn.	.....	.....	.....	.....	2.00	.....
Greencastle, Ind.	1.00@1.25	1.25	1.00	1.00	1.00	1.00
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.40	1.25	1.25	1.10	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montrose, Ia.	1.35@1.50	1.60	1.50@1.60	1.60	1.50	1.50
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	1.00	1.15	1.15	1.15	1.15	1.00
Sheboygan, Wis.	1.05@1.30	1.00	1.00	1.00	1.00	1.00
Southern Illinois	1.50	1.40	1.40	1.40	1.30	.....
Stolle, Ill. (I. C. R. R.)	1.55	1.55	1.55	1.30@1.35	1.50	1.50
Stone City, Iowa	.50	.....	1.40	1.35	1.30	.....
Toledo, Ohio	1.84	1.99	1.99	1.99	1.84	1.84
Toronto, Canada	1.90	2.40	2.40	2.15	2.15	2.10@2.15
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	.....	2.00	.....	1.45	1.45	.....
Chickamauga, Tenn.	1.10	1.00	.....	1.00	.93	.....
Dallas, Texas	1.10	1.25	1.25	1.25	1.25	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	1.25	.....	.....	1.25	1.25	1.25
Morris Spur (near Dallas) Tex.	1.10	1.25	1.25	1.25	1.25	1.25
Portland, Ga.	.60@1.00		(All other sizes 1.00@1.25)			
Shephard, Tenn.	1.00@1.25	1.00@1.25	1.00@1.25	.75@1.00	.75@1.00	.....
WESTERN:						
Atchison, Kans.	.50	2.10 (Rip-rap.	2.10	2.10 1.80 per ton)	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55@1.60	1.45@1.50	1.40
Bromide, Okla.	.60	1.50	1.50	1.50	1.30	1.30
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.80	1.80	1.80	1.80	1.80

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2 20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	1.10	.....
Bound Brook, N. J.	2.00	2.30	2.00	1.70	1.60	.....
Dresser Jct., Wis.	1.25	2.25	2.25	2.00	1.65	1.75
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.50	1.25@1.50	1.40
Dwight Station, Calif.			.75@1.00—all sizes			
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	1.00	1.80	1.70	1.50	1.50	1.50
Eastern Penna.	1.25	1.80	1.70	1.60	1.50	1.50
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@ .80	1.60@1.75	1.50	1.25	1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.50	1.50	1.50
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.25	2.10	1.85	1.85	1.85
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Columbia, S. C.—Granite	.75	.....	2.75	2.50	2.35	.....
Dell Rapids, S. D.—Granite	.75	2.00	2.10	2.10	1.60	.....
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	1.00	1.75	1.75	1.50	1.50	1.50
Eastern Penna.—Quartzite	.90	1.60	1.40	1.30	1.30	1.30
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@4.50	.....	.....	2.25@2.80	.....	1.50@1.75
Red Granite, Wis.	1.35	1.40	1.30	1.50	1.20	.....
Sioux Falls, S. D.—Granite	.75	2.00	2.00	2.10	1.60	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.	1.35	1.40	1.30	1.50	1.20	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk 4.50

Hillsville, Pa.—70% thru 100 mesh; sacks, 4.75; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Waltord, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk .. 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk 3.50

CENTRAL:

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh 8.00

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bettendorf, Ia.—Analysis, 97.16% $CaCO_3$, 1.9% $MgCO_3$—50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Buffalo, Ia.—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.00

Columbia, Ill., near East St. Louis—¼-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh 1.40

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 33.42% $CaCO_3$, 4.29% $MgCO_3$—52.4% thru 100 mesh, 59.4% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Limestone screenings; bulk 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, 93.10% $CaCO_3$, 3.2% $MgCO_3$—33.2% thru 100 mesh, 40% thru 100 mesh ..... 1.25@1.65

Mitchell, Ind.—50% thru 100 mesh 2.00

Montrose, Ia.—90% thru 100 mesh 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh ..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh ..... 3.25@5.00

50% thru 50 mesh ..... 1.75@2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ¼-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 100 mesh ..... .50

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Whitehill, Ill. — Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$ — 90% thru 100 mesh 5.00
50% thru 100 mesh 1.50
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25

SOUTHERN:

Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cartersville, Ga.—Analysis, all thru 10 mesh ..... 2.00@2.50
Claremont, Va. (Marlime) — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—(90% thru 100 mesh, $4.00), 50% thru 100 mesh 3.50
Dittlinger, Tex. — Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00
90% thru 4 mesh ..... 1.00@2.00
Ft. Springs, W. Va.—50% thru 100 mesh 3.00
Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh..... 2.50
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—50% thru 100 mesh..... 2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$—80% thru 100 mesh.... 3.00
All thru 10 mesh..... 2.50
80% thru 200 mesh..... 4.50
Paper bags, $1.50 extra per ton; burlap, $1.00 extra per ton.
Maxwell, Va. 2.50
Ocala, Fla. — Analysis, 98% $CaCO_3$—75% thru 200 mesh..... 4.50

WESTERN:

Colton, Calif.—Analysis, 90-97% $CaCO_3$, 2-3% $MgCO_3$—all thru 14 mesh..... 4.00
Sacks, 15c extra, returnable.
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 180 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk 4.50
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. ..... 2.25@2.75
Berkley Springs, W. Va..... 2.00@2.25
Cedarville and South Vineland, N. J.—
Damp 1.75
Dry 2.25
Cheshire, Mass. ..... 5.00@7.00
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 2.00@2.50
Mapleton, Pa.—Dry 2.50
Damp 2.00
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, Ohio..... 2.50@3.00
Montoursville, Pa.—Green, washed..... 1.40@1.75
Oregon, Ill.—Large contracts..... 1.75
Ottawa, Ill. ..... 1.25@1.50
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. ..... 3.00@3.50
Round Top, Md.—(washed-screened).... 1.25
St. Mary's, Pa.—Unwashed..... 2.25
Thayers, Pa.—Washed ..... 2.00@2.50
Utica, Ill. ..... 1.25@1.75
Zanesville, Ohio 2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 4.00
Molding fine, coarse and brass..... 2.00@2.10
Allentown, Pa.—Molding coarse & fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40@1.60
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse ..... 1.80@2.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .40@1.25
Sand blast ..... 3.50@4.50
Furnace Lining 2.00
Molding fine ..... 1.50@2.25
Molding coarse ..... 1.50@2.25
Stone sawing 1.50
Traction ..... .40@ .75
Brass molding 2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.	.....	1.30	1.30	1.30	.85	.85
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Buffalo, N. Y.	1.10	.95	.....	.....	.....	.....
Erie, Pa.	.....	1.00	.....	1.15	.....	1.25
Farmingdale, N. J.	.48	.48	1.50	1.50	1.30	1.30
Hartford, Conn.	.90	.....	1.25	1.15	1.15	1.1[illegible]
Leeds Junction, Me.	.....	.50	1.75	1.50	1.35	1.25
Ludlow, Mass.	.75*	.75*	1.70	.....	1.50*	1.50*
Philadelphia, Pa.	.75	.75	.....	1.40	1.25	.....
Pittsburgh, Pa.	.....	1.30	1.30	1.30	.85	.85
Portland, Maine	.....	.50	1.75	.....	1.35	1.35
Texas, Md.	.....	1.00	.....	Pure white sand, 1.50		
Washington, D. C.	.60@ .75	.60@ .75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.	.....	.85	.....	.....	.....	.....
Anson, Wis.	.40	.40@ .50	.....	.90	.....	.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.	.....	.60	.70	.70	.70	.70
Beloit, Wis.	.....	.40	.40	.....	.40	.....
Chicago, Ill.	.....	1.75@2.23	1.75@2.43	.....	.....	.....
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.80@1.00	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	100@1.25
Des Moines, Ia.	.....	.40@ .65	1.60	1.60	1.60	1.60
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.40	.....	1.25	.....	.90	.....
Elgin, Ill.	.....	.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.	.....	1.22	.....	2.17	.....	.....
Grand Rapids, Mich.	.....	.45	.....	.85	.....	.75
Greenville, Mechanicsburg, O.	.70	.60	.50	.60	.60	.60
Hawarden, Ia.	.....	.50	.....	.....	1.60	.....
Hersey, Mich.	.....	.50	.....	.70	.70	.....
Indianapolis, Ind.	.60	.60	.....	1.50	.75@1.00	.75@1.00
Janesville, Wis.	.....	.65@ .75	.....	.....	.65@ .75	.....
Le Mars, and Doon, Ia.	.....	.90	.....	1.80	.....	.....
Libertyville, Ill.	.....	.70	.....	.70	.70	.....
Mankato, Minn.	.50	.50	.75@1.50	.75@1.50	.75@1.50	.75@1.50
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.35@ .50	.35@ .50	1.50	1.50	1.50	1.25@1.50
Moline, Ill.	.80	.80	1.40	1.40	1.40	1.40
Riton, Wis.	.....	.40	.....	.....	.50	.50
St. Louis, Mo., f. o. b. cars	1.20	1.35	1.25	1.30	1.40	1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15	.....	2.10
Summit Grove, Clinton, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Winona, Minn.	.60	.50	1.75	1.50	1.25	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.	.....	.60@ .80	.70@ .80	.70@ .80	.70@ .80	.60@ .80
SOUTHERN:						
Alexandria, La.	.60@ .80	.50@ .75	.....	.....	.85@1.50	1.20@1.50
Birmingham, Ala.	1.48	all gravel—1.88				
Charleston, W. Va.	.....	(Sand, 1.40@1.50; gravel, 1.50				
Estelle Springs, Tenn.	1.25	1.20	1.10	1.00	1.10	.85
Ft. Worth, Tex.	.....	2.00	.....	2.00	.....	2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00@1.15	1.00@1.15	.....	2.12	1.92	1.74
Lake Weir, Fla.	.....	.75	.....	.....	.....	.....
Macon, Ga.	.....	.50@ .75	.....	.....	.....	.....
Memphis, Tenn.	1.12	1.12	.....	.....	.....	1.95
N. Martinsville, W. Va.	1.10	1.10	.....	1.30	.....	.90
New Orleans, La.	.50	.....	.....	.85	.85	.....
Pine Bluff, Ark.	.90@1.25	1.00@1.20	Washed gravel, all sizes, 1.75			
Roseland, La.	.25	.....	1.00	1.00	.....	.....
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10*	1.00*	.....	.....	1.50*	.....
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.	.....	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50*	1.50*	2.00*	1.50*	.....	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80	.....	.55@ .75	.....	.....	1.00
Cape Girardeau, Mo.	River sand, 1.00 per yd.					
Cherokee, Ia.	.80 per ton—1.20 washed					
Detroit, Mich.	1.10*	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)	.....	1.05	.....	1.00	.....	.....
East Hartford, Conn.	.65 per cu. yd.					
Elkhart Lake, Wis.	Washed gravel .66					
Estelle Springs, Tenn.	.....	.....	.....	.....	.....	.85
Fishers, N. Y.	.60	.65	.50	.65	.....	.50
Glenville, N. Y.	.....	.....	.....	1.00*	.....	.....
Hamilton, O.	.45 per cu. yd. in pit					
Hartford, Conn.	.....	1.00*	.....	.....	.....	.....
Hersey, Mich.	.....	.....	.....	.50	.50	.....
Indianapolis, Ind.	Mixed gravel for concrete work, .65					
Janesville, Wis.	.....	.65	.....	.....	.65@ .75	.....
Lindsay, Tex.	.....	1.95	.....	.....	.....	.60
Oxford, Mich.	.....	.....	.....	.65	.65	.....
Pine Bluff, Ark.	Road gravel .60					
Rochester, N. Y.	.60@ .75	.60@ .75	.....	.....	.50@ .65	.50@ .65
Roseland, La.	.....	.75	.....	.....	.....	.....
Saginaw, Mich., f. o. b. cars	.....	.75	1.30	1.30	1.30	1.30
St. Louis, Mo.	60% gravel, 40% sand, 1.50					
Summit Grove, Ind.	.60	.60	.60	.60	.60	.60
Waco, Texas	.....	.80	.....	1.50	.....	1.30
Winona, Minn.	.....	.....	.70	.70	.70	.70
Yardville, N. J.	.....	.50@ .75	.....	.....	.....	.....
York, Pa.	1.05	1.20	(crushed rock sand)			

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.50	1.10	2.50	1.25	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.90	1.50	1.00	1.00	1.00	1.00
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, O.	2.40	1.75	Other grades 1.75				
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.93	2.30	2.49	2.49	2.49	2.30	2.30
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.60	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7.50					3.50
Bellefonte, Pa.			11.50		8.00			
Berkley, R. I.			14.00					
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00*
Chaumont, N. Y.					2.50	4.00		
Paxtang and Le Moyne, Pa.					5.00		5.00@7.50	
Rockland, Maine						8.00		
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.	13.50	12.25	7.50@12.25	14.00			11.00	3.20
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa.		11.50	11.50	11.50			7.50	3.00‖
CENTRAL:								
Delaware, Ohio	10.50	9.00	8.00	9.50			8.00	1.60
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	8.50	8.50		6.75	8.75		
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Knowles and Valders, Wis.			12.50		5.00	9.00		
Marblehead, Ohio	10.50	9.00	9.00	11.00	7.50	9.50	8.00	1.70*
Mitchell, Ind.		12.00	12.00	12.00	10.00			
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50							
Woodville, O. (dlrs.' price)	10.50a	8.50a	8.00a	8.50a	7.50	8.00	8.00	1.70
SOUTHERN:								
El Paso, Tex.							12.50	
Knoxville, Tenn.	11.00	9.50	9.50				7.50	1.30
Sherwood, Tenn.	11.00	9.50	9.50	9.50	7.50		7.50	1.30
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.					12.00		15.00	2.00c
Los Angeles, Calif.			15.00‡				16.00	
San Francisco, Calif.	22.00		20.00		16.00		16.00	2.15*
Tehachapi, Calif.						15.00	20.30	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; ‖300-lb. bbl. §Paper sacks. a 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. b Burlap bags. c 200 lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Molding coarse	1.50@1.75
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.75
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.25@4.25
Traction sand	.50
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.00
Molding fine	2.25
Molding coarse	2.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.25@1.60
Howard, O.—Glass sand	3.00
Molding—Fine and coarse	1.75@2.00
Stone sawing	2.00
Core, roofing and brass molding	1.75@2.25
Sand blast	4.00
Furnace lining and traction	1.75@2.00
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.90@1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00@2.75
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Glass sand	2.25@2.50
Massillon, O.—Traction, molding fine and coarse, core, and furnace lining	2.50
Glass sand	3.00
Michigan City, Ind.—Core, glass, traction and brass molding	.30@ .40
Mineral Ridge, Ohio—Core, furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction (green)	2.00
Montoursville Pa.—Core	1.25@1.50
Traction	1.00
Brass molding	1.40@1.50
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
Sand blast	3.00
Glass, core and traction	2.75
Furnace lining	2.50
Brass molding	2.25
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00
Molding fine and coarse	1.00

Miscellaneous Sands

(Continued)

Sand blast	3.50
Ottawa, Ill.—Furnace lining, steel molding, core	1.50
Roofing sand	1.50@4.50
Sand blast	4.50
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core, damp	2.50
Roofing	3.00
Sand blast	3.50@3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	2.00
Furnace lining	1.00
Molding fine and coarse	1.00
Core—green	1.75@2.00
Utica, Ill.—Core, furnace lining, stone sawing	1.25
Molding fine	1.00
Molding coarse	1.20
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.25
Williamstown Junction, N. J.—Glass sand	2.80@2.90
Core, wet	2.50@2.60
Zanesville, Ohio—Molding fine and coarse, brass molding	2.00@2.25

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	45.00
Blanks, per lb.	.08
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh)	8.50@10.50
(In Kraft paper bags. $1.00 per ton less in burlap bags, plus 15c for each bag.)	
Emeryville, N. Y.—150-200 mesh; bags	14.00
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
Gouverneur, N. Y.—Ground talc (150-200 mesh)	13.50@14.50
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh), bags, 5.75@8.25; (200-300 mesh) bags	9.25@13.75
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Crude talc, f. o. b. mine	10.00
Ground talc (150-200 mesh)	15.00@17.50
Silver talc dust (600-mesh)	50.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.00@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%@72%	5.00@6.00
Mt. Pleasant, Tenn—Analysis, .70 B.P.L. (2000 lbs.)	7.50
Montpelier, Idaho—70% B.P.L.—Crude	5.00
Crushed 2-in. ring and dried	6.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00
Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Centerville, Tenn.—B.P.L. 60% to 65%	4.50@5.50
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Mt Pleasant, Tenn—B.P.L. 68%—13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Bound Brook, N. J.—Trap rock, carload lots; bulk		2.30
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md.—Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	11.00@17.00
Lincoln, Neb.—Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@32.50	20.00@25.00
Milwaukee, Wis.	21.00@30.00	21.00@27.50
Missouri river points—Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—White marble	7.00@12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00	26.00@34.00
Bellow Falls, Vt.	18.00	25.00
Birmingham, Ala.	16.00	27.50@50.00
Carpenterville, N. J.	15.50	40.00@65.00
Bridgeport, Conn.	31.00	32.00
Rochester, N. Y.	21.00	
Friesland, Wis.	25.00	
Houston, Tex.		21.00
Lockport, N. Y.	17.00	
Milwaukee, Wis.	12.50	26.00@40.00
Omaha, Nebr.	16.00@20.00	30.00@40.00
Piqua, O.	15.00	25.00@50.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore.	25.00	45.00@75.00
Puyallup, Wash.	22.00	35.00@75.00
Rapid City, S. D.	20.00	30.00@60.00
St. Paul, Minn.	15.00	30.00@35.00
Salt Lake City, Utah	20.00	35.00@55.00
Salem, Ore.	30.00	50.00@100.00
Seattle, Wash. (select)	20.00	50.00@60.00
Springfield, Ill.	18.00	20.00@25.00
Walkersville, Ont.	30.00	36.00
Wauwatosa, Wis.	14.00@15.00	30.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	9.00
Boston, Mass.	12.00@13.00
Brighton, N. Y.	14.25
Buffalo, N. Y.	16.50
El Paso, Texas (Face 13.00)	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	13.00
Michigan City, Ind.	10.00
Milwaukee, Wis. (delivered at job)	13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.—Common	15.00
Face	25.00
Redfield, Mass.	15.00
San Antonio Texas—Common	14.00
Face	27.50
South Dayton, Ohio	14.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	13.00@14.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.75	13.75
Fort Dodge, Ia.	19.70	17.00
Genoa, Ohio	10.50	.....
Grand Rapids, Mich.	15.65	.....
Gypsum, Ohio	13.90	.....
Los Angeles, Calif.	.....	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
Plasterco, Va.	19.80	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	24.00	.....

	Lump per 180-lb. Barrel (net)	
	Finishing	Common
Atlanta, Ga.	2.00	1.60
Baltimore, Md.	.....	12.00
Boston, Mass.	3.40	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.65
Dallas, Tex.	.....	2.75
Denver, Colo.	2.95	.....
Detroit, Mich.	2.00	1.80
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	.....	1.50
Montreal, Que.	15.00†	.....
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	1.65
San Francisco, Calif.	.....	2.25
Seattle, Wash.	3.50	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.86
Cedar Rapids, Ia.	2.28
Cincinnati, Ohio	2.37
Cleveland, Ohio	2.28
Chicago, Ill.	1.97
Dallas, Tex., incl. sacks 10c ea., 2.80; net	2.10
Davenport, Ia.	2.22
Denver, Colo.	2.80
Detroit, Mich.	2.31
Duluth, Minn.	1.95
Indianapolis, Ind.	2.23
Kansas City, Mo. (includes sacks)	2.85
Los Angeles, Calif.	3.31
Milwaukee, Wis.	2.19
Minneapolis, Minn.	2.26
New Orleans, La.	3.20
New York, N. Y. (includes bags)	2.35
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.02
Portland, Ore. (sacks 15c ea.)	3.20
St. Louis, Mo. (incl. sacks)	2.20
San Francisco, Calif.	2.84
(Pkge. 15c on and off.)	
St. Paul, Minn.	2.26
Toledo, Ohio	2.31
Seattle, Wash.	3.10
F. o. b. Seattle (including sacks)	3.50

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White‡ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ⅛x32x36" Weight 1500 lbs. Per M Sq. Ft.	⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.00	4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	23.75	19.00	19.375	20.00	36.75
†Eldorado, Okla.	.....	.....	.....	.....	10.00	10.50	.....	.....	15.50	.....	27.20	29.30	39.55
Fort Dodge, Ia.	3.00	4.00	6.00	8.00@11.00	10.00	10.50	15.45@22.00	.....	25.80	20.00	19.375	20.00	30.00
Grand Rapids, Mich.	3.00	4.00	6.00	8.00	10.00	10.00	18.50	.....	27.25	20.00	19.375	20.00	30.00
Gypsum, Ohio	3.00	4.00	6.00	8.00	10.00	10.00	19.25	7.50	27.95	19.00	19.375	20.00	30.00
Loveland, Colo.	3.00	4.00	6.00	8.00	10.00	10.50	.....	.....	29.80	.....	.....	.....	40.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	28.25	21.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	6.00	8.00	10.00	10.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.00	.....	7.00	8.00	10.00	10.00	20.90	.....	29.90	19.00	21.375	22.00	.....
†Southard, Okla.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	15.50	.....	26.20	28.70	39.40

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
• Shipment in bulk 25c per ton less; †Acme, Tex., freight rates govern; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News

Wisconsin Adopts Safety Orders on Quarries

GENERAL safety orders on quarries have been adopted by the State of Wisconsin to become effective January 7. These orders govern all kinds of quarry operations and provide for periodic inspection of the face of the quarry and of all equipment and daily inspection of all hoisting apparatus. Cables must have a maximum safe working load for not more than one-fifth of the breaking load and must be replaced when deteriorated by 20 per cent. Only one day's supply of explosives not exceeding 100 lb. may be kept in the quarry. The excess supply must be kept in bullet proof and fire resistant magazines located not nearer than 300 ft. from the highway or any building. Safe practices for handling explosives are also prescribed.

Illinois Cement Rates

HEARING in 13061, Universal Portland Cement Co. vs. A. T. & S. F. et al., in which Indiana cement interest complained against discrimination on account of the low level of cement rates existing intrastate in Illinois as compared with the interstate rates, scheduled before Examiner Hosmer in Chicago, December 5, was postponed at the request of H. M. Slater, rate expert for the Illinois Commission. He said that a conference between opposing parties would be held and that a settlement might result.

The largest item Illinois has to pay for road building is the freight on the material, which amounts to $6,500 per mile of road, said Mr. Slater, speaking for the Illinois Department of Public Works and Buildings, at the conference held after the postponement of the hearing. Railroad traffic men were not disposed to accept his estimate, however, without substantiating cost figures.

The complaint of the company asked for a revision of the Illinois intrastate rates on cement to remove discrimination against interstate shippers. Several Indiana and Missouri producers intervened on behalf of the complainants, and a number of Illinois producers in opposition. Slater said that Illinois had a road-building program laid out for 1922 which contemplated the use of over 4,000,000 bbls. of cement, and that the estimates had been made on the basis of the existing Illinois cement rates; he said any increase would mean curtailing the program.

Two propositions were submitted to the carriers, the first being that they apply, interstate, rates on the basis of the 1914 rates plus 2 cents and 35 per cent; the second, the application of the so-called scale 1 rates, prescribed by the commission for application in Mississippi river territory, also plus 2 cents and 35 per cent. Under these options, Slater proposed that individual discriminations be removed by adjusting the interstate to the intrastate rate.

The cement interests, for the most part, declined to state their position on either option. Railroad representatives pointed out that the proposals would not be of much value to the carriers unless the feeling of the producers was definitely known. They did not propose to put in a new set of rates only to have them immediately attacked. So far as the carriers themselves were concerned, they favored the second proposal as much as they favored either, because it would involve less loss of revenue, the scale 1 rates being somewhat higher than the 1914 rates.

It was finally agreed that Illinois was to prepare the two propositions and obtain expressions of opinion from producers, which would then be submitted for consideration to the executives of the roads involved. Since hearing on the postponed case has been tentatively set for January 3, it is expected that the written propositions will be submitted within a week or 10 days.

National Sand and Gravel Convention

The annual meeting of the National Association of Sand and Gravel Producers will be held in New Orleans, La., Feb. 1, 2, 3.

Reparation on Reconsigned Cement

AN AWARD has been recommended by Examiner John A. McQuillan in No. 12617, Cape Girardeau Portland Cement Co. vs. Director-General, as agent, St. Louis Southwestern, et al., on a holding that a combination rate of 57.5 cents per 100 lbs. on a carload of cement from Cape Girardeau, Mo., to Fisher, Ark., and reconsigned to Little Rock, Ark., shipped in November, 1919, was unreasonable to the extent that it exceeded 32 cents. He also recommended that the I. C. C. hold that demurrage and reconsignment charges collected on the shipment were not unreasonable. The examiner found an overcharge of $2 on demurrage and recommended refund thereof.

Solvay Process Co. to Extend Quarrying Operations

AN EXTENSION of its quarrying operations is being undertaken by the Solvay Process Co., Syracuse, N. Y., it is reported, by the purchase of three large farms at Chaumont—the company already has extensive holdings in the region—and that negotiations are under way to secure 10 adjoining farms. All the land in the neighborhood is of limestone formation and adaptable for quarrying.

As all of the 10,000 acres of land in this vicinity has water frontage, the plans will call for shipments of material by the water route. This will mean a large saving in transportation costs. It will be possible for a line of barges to operate between the harbor contemplated and Syracuse by way of Lake Ontario and the Oswego and Barge canals.

The new land contains limestone formations of similar strata to the land already owned and the deposits of barytes to be found in the new property will be of immense value. It is probable that quarrying operations will be put into effect on a much larger scale than those now being carried on.

Federal Aid Spent for Roads

HOW the government has employed Federal-aid funds for road building through the Bureau of Public Roads is shown in a summary recently prepared. The tabulation covers the expenditure of $211,135,276.31 from the beginning of the work up to November 1, 1921, a period of four years and four months. That sum was applied toward the construction of 28,135 miles of roads costing $496,151,683.43. The average cost was $17,630 per mile.

Nearly 36 per cent went into 4,653.6 miles of high-grade concrete roads. Next in size were total appropriations of $47,192,895.41, applied to building 10,043.5 miles of gravel road, at a cost of $104,614,066.71. The sum of $24,721,020.92 was applied to 6,864 miles of graded and drained roads costing $55,704,253.78.

High-grade bituminous-macadam roads, of which 1,323.2 miles were constructed, costing $41,412,557.22, claimed Federal-aid funds of $18,646,066.17; high type bi-

News—Continued

tuminous concrete, $9,299,864.32. That sum went toward the construction of 772.5 miles, which cost $23,445,374.88.

In building 44.6 miles of brick roads $6,925,482.13 was spent; 2,695.5 miles of sand-clay roads, $10,495,172.10. The total cost of sand-clay roads was $22,226,-362.66.

American Road Builders' Good Roads Show

WORD comes from the American Road Builders' Association that all of the initial 40,000 sq. ft. of space for the forthcoming thirteenth national Good Roads Show to be held at the Coliseum, Chicago, January 16 to 20 having been reserved by 86 exhibitors at the first drawing in October, the officials in charge have arranged for about 20,000 sq. ft. of additional space to care for a waiting list of about 50 firms. Arrangements have been made by Secretary Powers for about 12,-000 sq. ft. of space in the Coliseum balcony and 8,000 to 10,000 sq. ft. in two buildings adjoining the Annex.

There were 144 exhibitors at the show last year and the indications are that the number this year will approach nearer the 200 mark.

The U. S. Bureau of Public Roads will have a mammoth exhibit covering 2,000 sq. ft. of space and will demonstrate, in addition to everything exhibited heretofore, the best methods of choosing sites for new roads, as well as tests of road materials, drainage and subgrades and the effect of impact on both pavements and subgrades.

Fall Lettings Approved by Engineers

LETTING next year's highway contracts this fall, as advocated by Secretary Hoover, has met with general approval by highway engineers.

In the New England states weather conditions necessarily militate against this practice, but that section is doing all that it can in this respect. Connecticut has cut its red tape to make some lettings. Rhode Island will probably contract for practically all of its work in the 1922 program. Vermont is preparing for a fall letting.

Maryland, if the federal aid passes, will let a small amount, about $1,500,000. Delaware will let two grading jobs.

Virginia let a number of contracts in September and will let more this month —to an amount approximating $2,000,000.

In North Carolina a letting will be held every 10 days until January 1, putting under contract between $1,000,000 and $1,-500,000 worth of work each month. Georgia has plans and surveys completed to let at least $3,000,000 worth of work in six weeks after the federal appropriation is made.

South Carolina is letting contracts and will prosecute the work throughout the winter. Work in Mississippi is so far behind that no fall lettings will be had. In the next three months Florida will have advertised from $2,000,000 to $3,000,-000 worth of work. Tennessee will let as many contracts as possible.

In the Middle States, Illinois is letting contracts and will advertise additional work up to January 1. Kansas recognizes a number of advantages from fall lettings, but has not accomplished anything thus far. The Ohio department is letting all work that can be carried on this fall, holding sales continually. Work in Idaho is necessarily curtailed due to the delay in selling the bond issue. In Minnesota it is hoped that bids on the greater portion of the gravel surfacing and paving for next year will be made, the lettings to be held during November and December. For the past two years Iowa has let its contracts in the fall for next season's work.

Montana is advertising projects as rapidly as they are ready for construction. Utah has several projects ready for letting.

California's climate makes but little seasonal difference in lettings; the department is busily engaged on the $40,-000,000 state highway bond issue; state work will be fairly continuous for the next two or three years. New Mexico is letting contracts as fast as it is able to make surveys and plans.

National Crushed Stone Convention

The annual meeting of the National Crushed Stone Association will be held in Chicago, Ill., January 17, 18, 19.

Rates on Barytes

THE I. C. C. has dismissed No. 12109, Ault and Wiborg Co. vs. P. C. C. and St. L. et al., opinion No. 7246, 64 I. C. C. 443, holding that the rates on barytes, carloads, from Ivorydale, Ohio, to Argo, Ill., in April, 1919, and February, 1920, were not unreasonable or otherwise unlawful. Seventy-nine carloads were shipped on a rate of 16.5 cents. The complainant asked for reparation down to the basis of the subsequently established rate of 16 cents. It claimed that 16.5 cents was not the proper rate under General Order No. 28 because the rule for disposing of fractions was not fully observed.

The commission said that failure of the Director-General's servants to observe the rules laid down by him, and the subsequent publication of the rate said to be the one really ordered, was not enough to cause condemnation of the fractionally higher rate. The rate of 16.5 cents was supposed to be 90 per cent of the sixth class rate of 18 cents, but under the rule for disposing of fractions, the complainant contended 16 cents would have been the proper rate.

Will Erect a Million-Barrel Cement Plant

THE White Star Cement and Coal Co., of Birmingham, Ala., was recently organized at the offices of the company at Nazareth, Pa. It is a Delaware corporation with an authorized capital of $3,000,-000; there are 12,000 shares of stock at the par value of $25 per share.

A cement plant of 1,000,000 bbls. capacity will be erected at Village Springs, a suburb 22 miles north of Birmingham, Ala., where the company's extensive mineral deposits are located. Richard K. Meade & Co., of Baltimore, are the contracting engineers.

The incorporators are President A. G. Connolly, Secretary Charles W. K. Shafer and Treasurer G. A. Schneebeli.

"The Biggest Construction Year"

W. S. HAYES of the National Federation of Construction Industries, while visiting the headquarters of the National Crushed Stone Association, said recently:

"Direct information which we have assembled indicates that next year is to be the biggest construction year this country has had in a long time. Railroads are rapidly getting back to normal. Ballast will move. Fluxing conditions are already improved. Many states are hatching tremendous road programs. The commercial demand for crushed stone will be a surprise."

News of All the Industry

Incorporations

The Burbank Sand and Gravel Co., Burbank, Calif., has been incorporated at $10,000.

The Sioux Falls Sand Co., Sioux Falls, N. D., has been incorporated at $100,000 by Delbert Wheeler, Eva Wheeler and J. E. Harrington.

The Interstate Limestone Corporation, Binghamton, N. Y., has been incorporated at $200,000 by Ernest E. Kellogg, John F. Jones and D. Patcher.

The Rock Castle Cement and Lime Co., Pine Hill, Ky., has been organized with J. Roger McSherry, vice-president of the Train Securities Co., as president.

The Koury Calcium Co., McGregor, Tex., has been incorporated at $400,000 to develop a calcium limestone deposit in Coryell county, by W. V. Hanover, J. P. Philip, Waco, and Mike Koury, Houston.

The Green Road Stone & Supply Co., Cleveland, Ohio, has been incorporated at $250,000 to produce and sell stone and building supplies by C. C. Cooper, V. E. Scharff, B. G. Maag, Perry P. Quayle and H. S. Malone.

The Champion Gravel Co., Marquette, Mich., has been incorporated at $200,000. President, Philip B. Spear, Marquette; vice-president, Medio J. Bacco, Iron Mountain; secretary-treasurer, Frank B. Spear, Jr., Marquette. In Wisconsin the company will operate a sand and gravel plant, and in Michigan produce sand and gravel, crushed stone, build roads, buildings and sell building materials.

Quarries

Gouverneur, N. Y. — H. H. Hodgkin, of the Gouverneur Limestone Co., has purchased the Gardner property, about 20 acres. The property was formerly owned and operated by the Gardner Talc Co. There is a big ledge of the highest grade of limestone rock.

Vancouver, B. C.—The Vancouver Granite Co., Ltd., incorporated in 1900, is a subsidiary concern of Armstrong, Morrison & Co., Ltd., 815 Bower building, Vancouver, B. C. This company now owns and operates several quarries on Nelson Island and the sandstone quarries on Gabriola Island close to Nanaimo.

Little Rock, Ark.—Recent purchase of White Cliffs property on the Little river near Ashdown, Ark., for $500,000 and plans for developing the chalk deposits by a company capitalized at $1,000,000 are announced by Burton B. Tuttle, Cincinnati, who, representing Ohio capitalists, purchased the property from A. B. Banks and associates. The property includes 2,600 acres on the Memphis, Dallas & Gulf Railway.

Cement

The San Antonio Portland Cement Co., San Antonio, Texas, has increased its capital stock from $250,000 to $500,000.

Youngstown, Ohio.—Approximately $2,000,000 of district securities are being offered for public subscription. They include $750,000 of 8 per cent convertible notes by the Bessemer Limestone and Cement Co., Bessemer, Pa.

Consul E. Verne Richardson, Karachi, India, reports that a cement plant, capitalized at $650,000, is to be erected at Beleli, a station on the Northwestern Railway, which is eight miles from Quetta, the capital city of Baluchistan.

Shanghai, China.—A large cement plant is to be established at Lungwha, near Shanghai, according to Millard's Review. The capitalization of the project has been set at $1,000,000. As soon as sufficient subscriptions have been made to the stock, the machinery will be ordered from America and Europe.

The Monolith Portland Cement Co., Monolith, Calif., is reported to have secured the exclusive use of an immense limestone deposit, the Jameson mountain, for 100 years. The deposit is claimed to be practically free from magnesia and runs from 100 per cent pure lime to a combination of lime, silica and alumina.

Speed, Ind.—Fire of undetermined origin recently burned the large packing house at the Speed, Ind., mill of the Louisville Cement Co., 10 miles north of Jeffersonville. The loss is estimated at $10,000, covered by insurance. The one-story building was filled with several thousand barrels of cement. Cars on an adjoining track also were burned or damaged.

Lewistown, Mont.—A deal was made on November 7 whereby the Three Forks Portland Cement Co. takes over the well now being drilled by the Montana Pacific Oil syndicate. A site has been selected some 125 ft. up the hill from the present location and the work of tearing down the rig has begun. The Trident and Hanover plants of the Three Forks company, which have been idle since last March, will resume operations some time this winter, it is announced. The surplus stock on hand has been nearly all consumed and it is stated that with the building activity in sight for next season were the plants to remain closed until spring it would be impossible to manufacture enough cement to supply the trade.

Sand and Gravel

The Belmont Sand & Gravel Co., Grand Rapids, Mich., has opened an office in the Commercial Savings Bank building.

Newburg, Mo.—R. Young and C. B. Denton have commenced construction of a $10,000 gravel plant. Grading for the railroad into the new plant is under way.

Des Moines, Iowa—The Northwestern Gravel Co., which operates a gravel plant at Lake View, Ia., and has its headquarters in Des Moines, has located a gravel deposit on a tract of land near Quimby upon which it has taken an option.

The Pioneer Sand Co., St. Joseph, Mo., producer of Missouri river sand, supplies St. Joseph, northwest Missouri, northeast Kansas and southern Nebraska. Its tonnage production for the past five years is 375,000, or 75,000 tons annually. For 1921 half of its production was used for highway construction. Modern equipment and the best of transportation facilities give opportunity to serve a wide field efficiently and promptly.

Lime

The Palmer Lime and Cement Co., York, Pa., reports from its New York offices that its capital stock has been increased from $233,800 to $650,000.

Eagle Pass, Tex.—Another enterprise opening up here is a lime plant. C. L. Escher of Seguin is at the head of this enterprise and machinery and kilns are being installed almost in the city limits for the manufacture of high grade lime. Heretofore lime has been shipped here for all building purposes. Mr. Escher hopes to have his kiln turning out lime by the first of the year.

Delaware, Ohio.—Extensive improvements at the plant of the Scioto Lime & Stone Co. are in progress which will provide greater facilities for manufacture as well as prompt shipping of entire output. A new underground lime handling device is being installed which will convey the burned lime from the cooling pits to an elevator which fills the overhead bins feeding the hydrators by gravity. A crusher grinds the lump lime before it is dumped on the elevator. A picking table has also been provided. Lump lime will be loaded on cars by gravity by means of a cross conveyor in the underground system.

Manufacturers

The Blaw-Knox Co., Pittsburgh, Pa., will move its New York offices from the City Investing building to the Carbon and Carbide building, 30 East Forty-second street.

The Orton & Steinbrenner Co., Chicago, manufacturer of locomotive cranes, clamshell and orange peel buckets, has made arrangements with the F. C. Richmond Machinery Co., 117 West Second street, Salt Lake City, Utah, to represent it.

The Milwaukee Locomotive Manufacturing Co., Milwaukee, has recently prepared a catalog describing its gasoline locomotives in use in cement works, stone quarries and other industries. General specifications, accompanied by halftone illustrations, are given of the latest types of the company's gasoline locomotives, together with a description of the engines, brakes and sanders.

The Whiting Corporation, Harvey, Ill., has purchased a controlling interest in the Grindle Fuel Equipment Co., manufacturers of complete powdered coal plants for use in connection with steam boilers and various types of furnaces. The Grindle Fuel Equipment Co. has moved its offices to Harvey and will continue under the same name. The following officers have been elected: President, B. H. Whiting; Secretary-Treasurer, T. S. Hammond; Vice-President and General Manager, A. J. Grindle.

The Engineering Advertisers' Association is publishing a monthly bulletin for its members which gives a digest of addresses made at meetings and includes information regarding the movement of goods from industry to industry, etc. The current copy includes an address by Kenneth Groesbeck of the Harry Porter Co., New York, on "The Baconian Theory of Advertising." A limited number of copies of the Bulletin will be sent upon request to the advertising managers of concerns selling technical or engineering products.

Personal

S. B. Kantowitz is in charge of the newly established Eastern office of the Raymond Brothers' Impact Pulverizer Co. at 50 Church street, New York.

H. Graham, formerly manager of the Lone Star Stone Co., Fort Worth, Texas, has accepted the position of manager of the Buckeye Stone Co., Corsicana, Texas.

R. C. Yeoman, extension engineer of the Indiana Sand and Gravel Producers' Association, will represent that association on the National Rate Committee in connection with the Central Freight Association rate complaint.

Charles R. Leo, formerly the general manager of the Palmer Lime and Cement Co., 103 Park Avenue, New York, has been elected to the position of vice-president of the company. Mr. Leo takes the place of Carlston H. Palmer, who has resigned, and C. C. King, superintendent of the York, Pa., plant, will be general manager.

Frank T. Sheets, formerly engineer of design, Illinois Division of Highways, has been made superintendent of highways, succeeding Samuel Bradt. Mr. Sheets has been connected with the division since 1914, when he was appointed assistant engineer. As engineer of design, he has supervised the work of the offices of road engineer, bridge engineer and nine district engineers on location, survey, plan, estimate, specifications and contracts, for work amounting to about $35,000,000.

A. J. R. Curtis, Chicago, Ill., has been elected president of the American Society of Agricultural Engineers for the coming year. Mr. Curtis is recognized as one of the best informed engineers in farm buildings in the organization. Since his graduation from Lewis Institute in 1909 he has been engaged in educational and farm promotive work. During the world war he was inspector of all government concrete schools. At the present time he is manager of the Cement Products Bureau of the Portland Cement Association in Chicago.

E. H. Bingham, for more than 20 years general manager of operations of the Solvay Process Co., Syracuse, N. Y., has resigned. Mr. Bingham, who had been manager of the Detroit plant for many years, came to Syracuse early in the present year and took over the duties of the late John D. Pennock. His work will be taken over by James P. Clune, who succeeded Mr. Bingham at Detroit and was formerly in charge of Solvey plants at Hutchinson, Kans. G. S. Rutherford, works manager at the Syracuse plant, will take up Mr. Cline's work in Detroit. Lyndon S. Tracy, who was assistant works manager in Syracuse, will take over Mr. Rutherford's position as works manager. The position of assistant manager of operation has been abolished.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

STEEL RAILS

We offer for immediate shipment the following choice lots of relaying steel rails:

3,000 tons 60 lb., with angles.

2,000 tons 56 lb., with angles.

Free delivery to any point on Illinois Central R. R., south of St. Louis; attractive prices also can be made to any contiguous territory or for export.

600 tons 35 lb., with angles, located at Red Lick, Miss. This rail is well situated for delivery to points in Alabama, Mississippi and Louisiana, or for export.

300 tons each 30 lb. and 35 lb., located Whelen Springs, Arkansas.

250 tons first-quality new 25 lb. billet steel rails, and fastenings, located Austin, Texas.

Terms will be made to responsible buyers. Address inquiries to

Shook & Fletcher Supply Co., Inc.
Birmingham, Ala., or
Birmingham Rail & Locomotive Co.
Birmingham, Ala.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½x25′, 4x30′, 5½x50′ 6x50′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 3½x25′, 5x60′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 2½x3″ 3x3½′ pebble and ball mills; 8x4′, 6x4′ and 4x4′ continuous ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 30x60″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36" and 40″ cage mills; 3′ and 4½′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

IMMEDIATE DELIVERY

NOS. 6, 7½, 9K & 18K CRUSHERS.
50-75 HP. single drum hoists, 25 Cy. Motors, 440 V. 3 Ph.
25-50-100 Kw. Eng. & Turbo sets, D.C. & A.C.
250-300-500 Kw. Turbo & Eng. Sets.
BELT & STEAM DRIVEN COMP., 50-5000 ft.
2-6-12 Ton 24 in. Gauge Gasoline Locos.
6-8-10 in. Sand Pumps, belt and 6″ Eng. Drive.
25-40 HP. double drum Elec. Hoist, 440 V. 60 Cy. 3 Ph.
5-10-15 Ton Holt Tractors.
2—290 HP. NEW B&W 200 lb. boilers.
150 HP. 156 lb. Boiler, buttstrap, Indpls.
9K GATES REG. DRIVE, BARGAIN, $4650.00.

Send Us Your Inquiries, Centrif. Pumps, Motors, Compressors, Electrical Equipment, etc.

ROSS POWER EQUIPMENT COMPANY
Indianapolis, Ind.

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
1 New, set of manganese concaves.
1 New, main shaft.
1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

FOR SALE

10″x14″ Vulcan 12-ton dinkey 36″ gauge.
Marion drag line excavator, 50′ boom, shop number 4058.
5 roller, high side Raymond pulverizer.
Williams swing hammer pulverizer, number D-43.
20 3-yard side dump 36″ gauge, Oliver tram cars.
14 1¼-yard, side dump, all steel, 36″ gauge tram cars.
12 1-yard, side dump, all steel 36″ gauge tram cars.
2 American process dryers, 24′ long by 48″ diam., sprocket driven.
125 h.p., 16″ by 24″ steam engine.
6 h.p. F. & M. gasoline engine.
Worthington Steam pump 10″ intake, 8″ discharge, 20″ cylinders, shop number 16876.

E. W. COOPER
174 Third Ave., North Nashville, Tenn.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

FOR RENT AND SALE

13—6-yd. re-built dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 mos.
1—Marion 36 combination shovel and drag-line, No. 4725, caterpillar traction, 1½-yd. bucket, used 4 mos.; built March, 1921.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—P. & H. gasoline drag-line and crane, caterpillars, 40′ boom, ½-yd. bucket, new 1921.
1—Northwest gasoline drag-line and crane, caterpillars, 40′ boom, ½-yd. bucket, new 1921.
1—No. 2 Brown-Hoist four-wheel gasoline crane, std. ga., 40′ boom, ½-yd. bucket, new 1921.

LOCOMOTIVES

1—40-ton 17x24 in. four-wheel switcher.
2—NEW 25-ton six-wheel Porters, separate tenders, 36 in. gauge.
2—18, 14, and 10-ton Vulcans, 36 in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

EQUIPMENT FOR SALE

BOILERS

1—250-H.P. Sterling.
1—300-H.P. B. & W.
2—72″x18′ H. F. T. Boilers.

ENGINES

1—24x48 Corliss.
1—18x30 Side Crank Buckeye.
1— 6x 6 Vertical.
1— 6-H.P. Fairbanks and Morse Gasoline.
1—10-H.P. Fairbanks and Morse Gasoline.

WATER HEATERS

1—30 in. x 8 ft. Pittsburg.
1—33 in. x 7 ft. 6 in. Hoppes.
1—30 in. x 7 ft. 6 in. Morrison.

WATER PUMPS

1—5x9x12½x10 in. Compound Duplex Worthington.
1—7x4½x8 Pulling.

STACKS

1—48 in. x 80 ft.

RAIL EQUIPMENT

8—36 in. gauge end dump Quarry Cars.

CRUSHERS

1—30 in. Jeffrey Swinging Hammer Pulverizer.
1—12″x20′ Screw Conveyor.

DREDGE MACHINERY

1—Set Dipper Dredge Machinery, 1½ yard Dipper, complete.

THE OHIO GRAVEL BALLAST CO.
2103 Union Central Bldg. Cincinnati, Ohio

DRYERS

Having purchased 30 dryers 4′-0″ dia. x 30′-0″ long, with rollers, tires, gears, shafting, blowers, etc., we are prepared to offer them at a sacrifice before removal. Dryers are new and were never used. Furnace grates and doors or steam coils supplied. Write for price.

McDermott Bros. Co.
Allentown, Pa.

New Rubber Belting

300 ft. 12″ 6-ply	$0.99 per ft.
423 ft. 14″ 5-ply	1.04 per ft.
527 ft. 14″ 6-ply	1.25 per ft.
529 ft. 16″ 6-ply	1.39 per ft.
520 ft. 16″ 8-ply	1.90 per ft.
150 ft. 18″ 6-ply	1.48 per ft.
512 ft. 18″ 8-ply	2.00 per ft.

Rolls cut to any length.

The National Belting & Salvage Co.
268 East Water Street, Milwaukee, Wis.

Used Equipment

USED MARBLE WORKING MACHINERY FOR SALE

Patch Carborundum machine 6x10 bed; two 12-ft. rubbing beds; one 8-ft. planer; four buffing machines; three gritting machines. All with direct connected motor drive. Also a lot of carborundum and steel centre wheels. All of this machinery is in excellent operating condition and will be sold at low prices.

N. O. Nelson Marble Works - - - - Edwardsville, Illinois

STEAM SHOVELS

2—Type O Thew, traction, ⅝-yd. dippers.
1—Type A-1 Thew, traction, ⅞-yd. dipper.

Tractor

1—Holt 30-45 Hp. Caterpillar, overhauled, real bargain.

GREAT LAKES EQUIPMENT CO.
327 S. La Salle St. Chicago, Ill.

New—RAILS—Relaying

All sections on hand for quick shipment Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa

Complete Quarry Equipment

to those contemplating new construction or additions to quarry equipment for the season of 1922.

As a result of alterations in plant equipment, and discontinuing of one operation, a large operator in the stone crushing field has for sale a complete line of high class used equipment, consisting of crushers, elevators, screens, compressors, steam shovels, locomotives and cars (36-in. ga.), and other miscellaneous equipment.

This equipment is in A-1 condition, and should be sold direct to users. If in the market, address

Box 1522, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Jaw Crusher, 48x60" opening.

RAMPUS STONE COMPANY
Strawberry Plains, Tenn.

WANTED

2 end dump quarry cars, steel body 1½ yd. 36". 1 No. 2 Gates Gyratory Crusher.

Give complete description in first letter, also location.

Wabash Stone Co., Geneva, Ind.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

Classified Advertising

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

ANNOUNCEMENT

We have 21 years' experience in building, operating and planning sand and gravel plants and have had experience in long distance pumping. We wish to announce that from now on we will take up the position of planning and engineering and testing sand and gravel deposits and building sand and gravel plants, inspecting boilers and all kinds of sand and gravel machinery. We do not belong to any equipment maker. Your plant will be erected with the most suitable equipment and the most practical way to suit your condition. Will work and overhaul all makes of plants. Let us help you solve the defects and place your plant on paying basis. Our price is reasonable. Write to

OQUAWKA SAND & GRAVEL CO.
P. O. Box 124 Gladstone, Ill.

WANTED

Foreman for small lime and crushing plant. Must be reliable, able to handle men and get results. Business is growing and offers good opportunity to the right man. Give full particulars with reply—age, experience, references and salary expected. Address

Box 1524, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE

No. 8 Austin Gyratory Crusher, Right Hand Agne Drive. Austin Elevator 67½-foot Centers 30-in. Buckets. 48-in. x 20-ft. Austin Screen. 24 x 24 Friction Hoist. 100 hp., 900 r.p.m., 3 phase, 60 cycle, 220 volt General Electric Motor. Above machinery in good condition, having crushed only about 250,000 tons limestone. Centrally located. Address

Box 1517, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

PLANT FOR SALE

Sand and Gravel, Lime and Sand-Lime Brick Plant. 55 acres in fee simple. A 100 ft. ledge of the best Lime Rock; first class opportunity for Crushed Rock business, with demand for entire output. Continuous operations. Will sell Sand-Lime Brick Machinery separately. Less than $25,000 will buy this complete plant, and present management will guarantee it good for 15 to 20% net profits. Two fully developed Sand pits; side hill operations. Also Lime Rock quarry adjacent to Lime Kiln. Located in Kentucky on Main Line Ry., 50 miles from center of Blue Grass section. Constant demand for full output of Sand and Gravel. For particulars and price, address

Box 1515, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

GLASS OR SILICA SAND PRODUCTION

Reliable and capable man familiar with every detail of construction and operation of plants for this material, wants place as superintendent. Address

Box 1521, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

JAW CRUSHER PLANT WITH POWER

Complete Plant and Power; Acme 11 x 22 Jaw Crusher, a 28' Elevator Bucket Outfit, 16' x 30" Rotary 5-Section Screen, a 50 ton 6-pocket Bin on wheels, Port Huron 35 hp. Steam Traction Engine, Pump, Belts and Fittings.

STEAM SHOVELS

Model 60-E Marion, R. R. Type.
Model 20 Marion, 260° revolving; "Rock" Dipper.

GEN. EQUIP. CO., Gridley Bldg., Syracuse, N. Y.

WANTED

Position as manager or superintendent of works. Thoroughly experienced in the manufacture of portland cement, fertilizers and agricultural limestone. Competent to act as general superintendent of several factories. Technically trained. Address

Box 1520, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

SUPERINTENDENT

desires engagement, crushing plant; over 20 years' experience in heavy rock excavation; crushing plants; thoroughly experienced; steam shovel operations; expert blasting; efficient transportation; agricultural limestone plants; and efficient handling of labor; excellent references. Address

Box 1513, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR LEASE or WOULD SELL

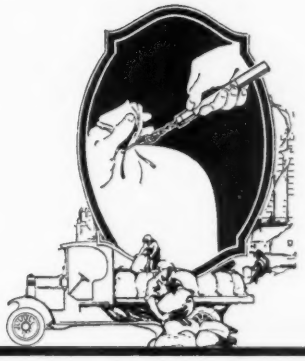
A well equipped stone quarry with Lime Kilns and Stone Crushing Outfit. In first class shape, and in operation with plenty of stone. Address

Box 1523, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Position as manager or superintendent of lime plant. Thoroughly experienced. Will go anywhere in U. S. or Canada. Address

Box 1516, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.



Bates Wire Ties Now Sell at Less Than Pre-War Basis

Write for the new prices on Bates Wire Ties—they cost you less than string—actually priced lower than during the pre-war period.

If you are using the Bates System of Tying, stock up at the new prices.

If you haven't adopted the Bates System yet—

Send for this FREE Trial Bag Tying Outfit

The Bates FREE Trial Bag Tying Outfit, containing one Bates Spring Return Tying Tool and 20 each of 4, 4½, 5, 5½ and 6 inch Bates Wire Ties, will be sent you on receipt of your signed agreement to try this Bag Tying Outfit on your work, and then within 15 days, send $2.50 for the outfit or return the tool to us.

These trial ties cost you NOTHING.

BATES VALVE BAG COMPANY

7326 South Chicago Ave. Chicago, Ill.

110 Great Portland St. London, W. I., England

Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.

ELEVATOR BUCKETS

PLAIN AND PERFORATED

General Sheet and Light Structural Work

"Light and Heavy Steel Plate Construction"

Hendrick Mfg. Co.

CARBONDALE, PA.

New York Office, 30 Church Street
Pittsburgh Office, 915-916 Union Bank Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

WHEN in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our readers. Use it.

Rock Products

The Nation's Business Magazine of the Rock Products Industry

542 South Dearborn Street
Chicago, Illinois

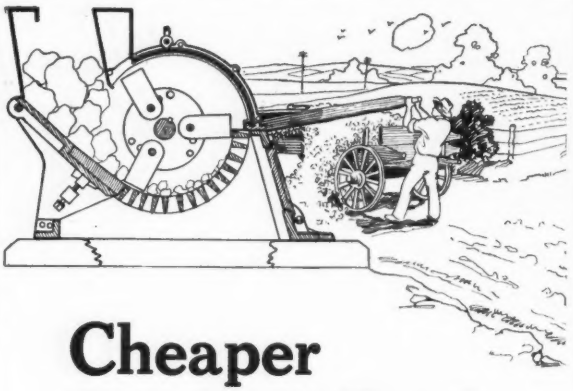
McGinty Grates

Economy

McGinty Grates are economical in operation because they withstand a higher degree of heat without warping than any other grate, and because of the greater air area you are able to burn low grade coal.

It is a shaking, sifting and dumping grate — and the fires can be cleaned with closed doors.

The Kramer Bros. Foundry Co.
Dayton, Ohio



Cheaper Crushed Rock

with Williams Crushers

WILLIAMS Crushers are labor savers. By using the Williams Crusher you avoid much expensive sledge-hammer work. Even the smaller Agricultural Limestone Crushers will take almost any stone one man can handle and reduce it to agricultural size. The "Mammoth" model used largely in cement plants, will take 36-in. stone and break it to 10 in. and smaller. The "Jumbo" model will take 14-in. stone or No. 5 gyratory feed and break it to 1½ in. and smaller in one operation, thus saving several operations and several machines. More than fifty cement manufacturers use Williams Crushers.

Data from Users

Williams leadership in this field has been due to the individual service given with each installation. Let our engineers analyze your needs. If a complete installation is required, you will be under no obligations if we submit preliminary plans. **Let the originator of the hinged-hammer principle fit it to your needs.** Write for the facts as Williams customers tell them.

Address Dept. 4

WILLIAMS PATENT CRUSHER AND PULVERIZER COMPANY
HINGED HAMMER — ESTABLISHED 1871

Plant and General Offices
2701-2723 North Broadway
St. Louis, Missouri, U. S. A.

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37 W. Van Buren St. Chicago, Ill.

Williams
Patent Crushers – Grinders – Shredders

A radical departure in Screens

The Simplex Screen

Gravitation Principle—Wullstein Patents

No Cross Wires
No Openings with Closed Ends
Constantly Increasing Space Between All Teeth

Resulting in

AN ABSOLUTELY NON-CLOGGING SCREEN

No Power
No Labor
Huge Capacities
Efficient Screening
Long Life
Sectional Construction
Permitting Renewal of Desired Part Without Disturbing Other Parts

Simplex Screens now in successful operation handling many different materials.

Outline your requirements to us. Ask for Bulletin 10-B.

SIMPLEX SCREEN CO.

Felt Building **Salt Lake City, Utah**

Buyers' Guide of the Rock Products Industry

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New York, N. Y.

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Bates Valve Bag Co.
Chicago, Ill.
Jaite Co., The
Jaite, Ohio
Valve Bag Co. of America
Toledo, Ohio

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International Cooperage Co.
Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co.
Toledo, Ohio.

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Cincinnati, Ohio
New York Belting & Packing Co.
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Orton & Steinbrenner
Chicago, Ill.

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Browning Co.
Cleveland, Ohio.
McMyler Interstate Co.
Cleveland, Ohio.
Owen Bucket Co.
Cleveland, Ohio.

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Blaw-Knox Co.
Pittsburgh, Pa.
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Bangor, Pa.
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Easton, Pa.
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Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

Cement Mill Repairs
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Conveyors and Elevators
Caldwell, H. W., & Son Co.
Chicago, Ill.
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Link Belt Co.
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Boston, Mass.
Universal Road Mach. Co.
Kingston, N. Y.

Cranes—Locomotive Gantry
Ball Engine Co.
Erie, Pa.
Byers Mach. Co., The
Ravenna, Ohio
McMyler-Interstate Co.
Cleveland, Ohio.
Ohio Locomotive Crane Co.
Bucyrus, Ohio.
Orton & Steinbrenner
Chicago, Ill.
Osgood Co., The
Marion, Ohio.

Crushers and Pulverizers
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.
Austin Mfg. Co.
Chicago, Ill.
Bacon, Earle C., Inc.
New York, N. Y.
Buchanan Co., Inc., C. G.
New York, N. Y.
Butterworth & Lowe
Grand Rapids, Mich.
Chalmers & Williams
Chicago Heights, Ill.
Fuller-Lehigh Co.
Fullerton, Pa.
Jeffrey Mfg. Co., The
Columbus, Ohio.
K. B. Pulverizer Co.
New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp.
New York, N. Y.
Kent Mill Co.
Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co.
Lewistown, Pa.
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Hollidaysburg, Pa.
Munson Mill Machinery Co.
Utica, N. Y.
New Holland Machine Co.
New Holland, Pa.
Pennsylvania Crusher Co.
Philadelphia, Pa.
Raymond Bros. Impact Pulverizer Co.
Chicago, Ill.
Smidth & Co., F. L.
New York, N. Y.
Smith Eng. Works
Milwaukee, Wis.
Sturtevant Mill Co.
Boston, Mass.
Traylor Eng. & Mfg. Co.
Allentown, Pa.
Universal Road Mach. Co.
Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co.
Chicago, Ill.

Crusher Feeder
Maddox Fdy. & Mchy. Co.
Archer, Fla.

Crusher Repairs—Manganese Steel
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Derricks
Terry Mfg. Co.
New York, N. Y.

Dipper Teeth
American Manganese Steel Co.
Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

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The Loomis Machine Co.
Tiffin, Ohio.
Sanderson Cyclone Drill Co.
Orrville, Ohio.
Wood Drill Works
Paterson, N. J.

Drillers
Pennsylvania Drilling Co.
Pittsburgh, Pa.

Dryers
American Process Co.
New York City.
Vulcan Iron Works
Wilkes-Barre, Pa.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

Dynamite
Du Pont de Nemours & Co., E. I.
Wilmington, Del.
Grasselli Powder Co.
Cleveland, Ohio.

Engines, Steam
Morris Mach. Works
Baldwinsville, N. Y.

Engineers
Arnold & Weigel
Woodville, Ohio.
Bacon, Earle C., Inc.
New York, N. Y.
Buckbee Co., J.C.
Chicago, Ill.
Fuller Engineering Co.
Allentown, Pa.
James N. Hatch
Chicago, Ill.
R. W Hunt & Co.
Chicago, Ill.
Randolph-Perkins Co.
Chicago, Ill.
Smidth & Co., F. L.
New York, N. Y.
Schaffer Eng. & Equip. Co.
Pittsburgh, Pa.

Excavators
Ball Engine Co.
Erie, Pa.
Owen Bucket Co.
Cleveland, Ohio.

Excavators—Dragline Cableway
Link-Belt Co.
Chicago, Ill.
Sauerman Bros.
Chicago, Ill.

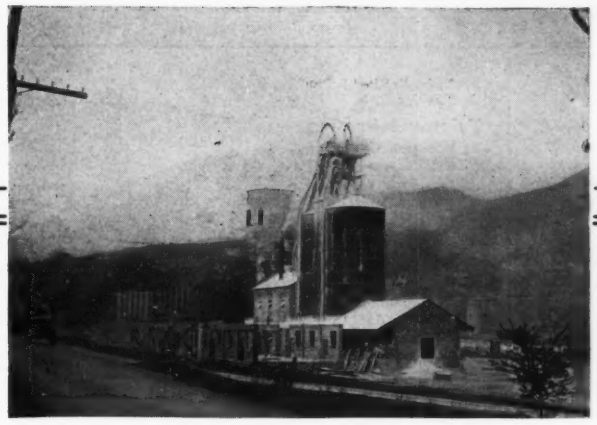
Explosives
Du Pont de Nemours & Co., E. I.
Wilmington, Del.
Graselli Powder Co.
Cleveland, Ohio.

Fuses
Ensign-Bickford Co.
Simsbury, Conn.

Gas Producers
Morgan Construction Co.
Worcester, Mass.

Gears
Caldwell, H. W., & Son Co.
Chicago, Ill.
Plamondon Mfg. Co.
Chicago, Ill.

(Continued on page 64)

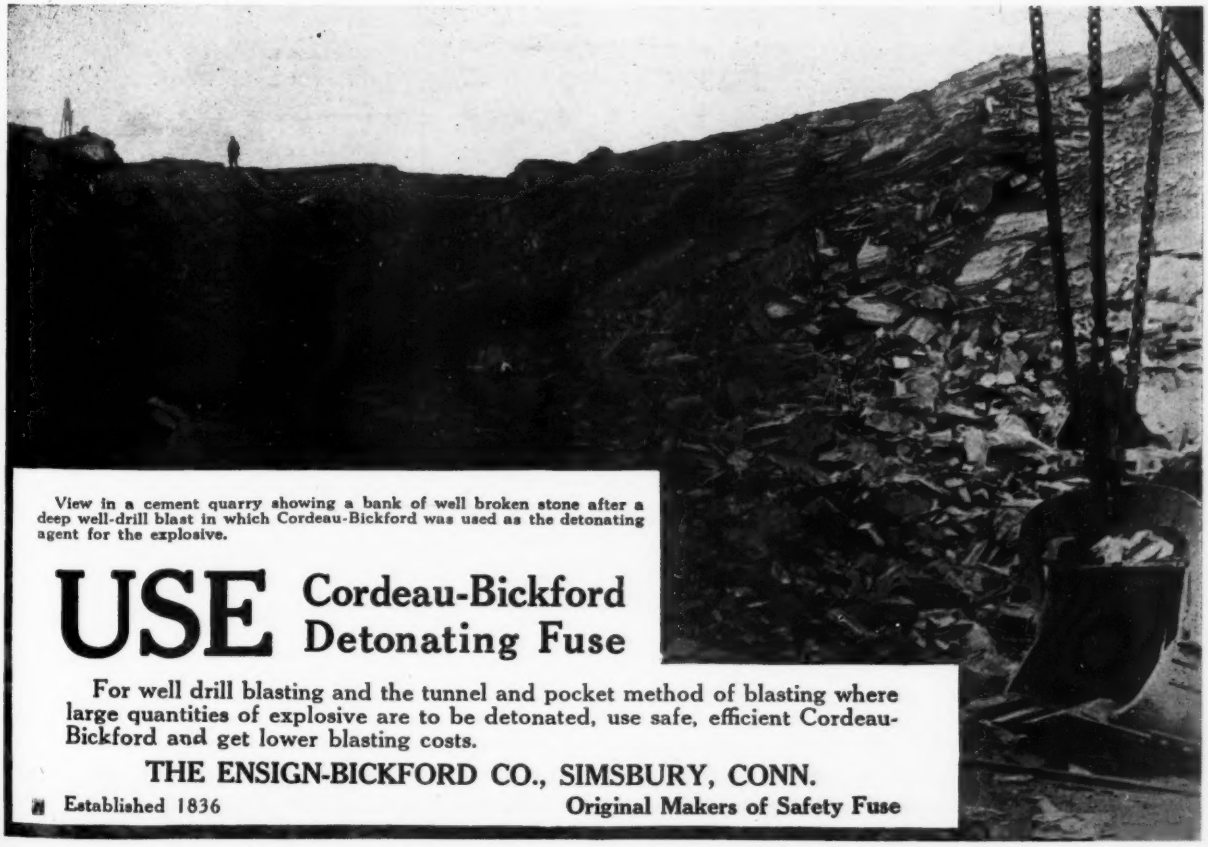


Schaffer Lime Plants can be built in small units embodying all the essential economical features of our large plants. Owing to freight conditions and the necessity for localizing certain operations, the

Schaffer Engineering & Equipment Co.

are in a position to offer a real service in connection with the design and installation of lime plants of either large or small capacity. The matter of economy in operation, whether in large or small units, will be paramount for the next several years. Also the necessity of quality as evidenced by Schaffer Engineering and Equipment Company plants is equally important.

Schaffer Engineering & Equipment Co.
2828 Smallman Street **PITTSBURGH, PA.**



View in a cement quarry showing a bank of well broken stone after a deep well-drill blast in which Cordeau-Bickford was used as the detonating agent for the explosive.

USE Cordeau-Bickford Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

THE ENSIGN-BICKFORD CO., SIMSBURY, CONN.

Established 1836 **Original Makers of Safety Fuse**

(Continued from page 62)

Glass Sand Equipment
Lewistown Fdy. & Mach. Co.
Lewistown, Pa.

Grates
The Kramer Bros. Fdy. Co.
Dayton, Ohio.

Grinding Mills
Munson Mill Machinery Co.
Utica, N. Y.

Hoists
Flory Mfg. Co., S.
Bangor, Pa.

Vulcan Iron Works
Wilkes-Barre, Pa.

Hose—Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co.
Cincinnati, Ohio.

N. Y. Belting & Packing Co.
New York, N. Y.

Hydrating Machinery
Atlas Car & Mfg. Co.
Cleveland, Ohio.

Kritzer Co., The
Chicago, Ill.

Miscampbell, H.
Duluth, Minn.

Schaffer Eng. & Equip. Co.
Pittsburgh, Pa.

Toepfer & Sons Co., W.
Milwaukee, Wis.

Hydraulic Dredges
Morris Machine Works
Baldwinsville, N. Y.

Lime Kilns
Arnold & Weigel
Woodville, Ohio.

Glamorgan Pipe & Fdy. Co.
Lynchburg, Va.

Steacy-Schmidt Mfg. Co.
York, Pa.

Vulcan Iron Works
Wilkes-Barre, Pa.

Loaders and Unloaders
Ball Engine Co.
Erie, Pa.

Jeffrey Mfg. Co., The
Columbus, Ohio.

Locomotives
Baldwin Locomotive Works, The
Philadelphia, Pa.

Fate-Root-Heath Co.
Plymouth, Ohio.

Hadfield-Penfield Steel Co.
Bucyrus, Ohio.

Jeffrey Mfg. Co., The
Columbus, Ohio.

Lima Locomotive Works
New York, N. Y.

Porter Co., H. K.
Pittsburgh, Pa.

Vulcan Iron Works
Wilkes-Barre, Pa.

Whitcomb Co., Geo. D.
Rochelle, Ill.

Motor Trucks
Pierce-Arrow Motor Car Co.
Buffalo, N. Y.

Traylor Eng. & Mfg. Co.
Allentown, Pa.

Packing—Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber & Mfg. Co.
Cincinnati, Ohio.

N. Y. Belting & Packing Co.
New York, N. Y.

Paint and Coatings
Williams, C. K., & Co.
Easton, Pa.

Perforated Metals
Chicago Perforating Co.
Chicago, Ill.

Cross Eng. Co.
Carbondale, Pa.

Hendrick Mfg. Co.
Carbondale, Pa.

Pipe Joints
Berry Flexible Pipe Joint Co.
Philadelphia, Pa.

Plaster Machinery
Butterworth & Lowe
Grand Rapids, Mich.

Ehrsam & Sons Co., J. B.
Enterprise, Kans.

Portable Conveyors
Stephens-Adamson Mfg. Co.
Aurora, Ill.

Pumps
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

American Manganese Steel Co.
Chicago Heights, Ill.

Morris Machine Works.
Baldwinsville, N. Y.

Power Transmitting Machinery
Caldwell, H. W., & Son Co.
Chicago, Ill.

Powder
Du Pont de Nemours & Co., E. I.
Wilmington, Del.

Grasselli Powder Co.
Cleveland, Ohio.

Pulverized Fuel Equipment
Fuller-Lehigh Co.
Fullerton, Pa.

Raymond Bros. Impact Pulv. Co.
Chicago, Ill.

Pump Valves
N. Y. Belting & Packing Co.
New York, N. Y.

Quarry Equipment
Universal Road Mach. Co.
Kingston, N. Y.

Rope, Wire
American Steel & Wire Co.
Chicago, Ill.

Leschen, A., & Sons Co.
St. Louis, Mo.

Scrapers, Drag
Sauerman Bros.
Chicago, Ill.

Screens
Cross Eng. Co.
Carbondale, Pa.

Hendrick Mfg. Co.
Carbondale, Pa.

Jeffrey Mfg. Co., The
Columbus, Ohio.

Link Belt Co.
Chicago, Ill.

Simplex Screen Co.
Salt Lake City, Utah.

Smith Eng. Works
Milwaukee, Wis.

Stephens-Adamson Mfg. Co.
Aurora, Ill.

Stimpson Equip. Co.
Salt Lake City, Utah.

Sturtevant Mill Co.
Boston, Mass.

Tyler Co., The W. S.
Cleveland, Ohio.

Universal Road Mach. Co.
Kingston, N. Y.

Separators
Rubert M. Gay Co.
New York City.

Raymond Bros. Impact Pulv. Co.
Chicago, Ill.

Sturtevant Mill Co.
Boston, Mass.

Tyler Co., The W. S.
Cleveland, Ohio.

Separators, Magnetic
Buchanan Co., C. G., Inc.
New York, N. Y.

Shovels—Steam and Electric
Ball Engine Co.
Erie, Pa.

Bucyrus Co.
South Milwaukee, Wis.

Osgood Co., The
Marion, Ohio.

Shovel Repairs—Steam and Electric
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Shoveling Machines
Myers-Whaley Co.
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Slate Working Machinery
S. Flory Mfg. Co.
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Steel Plate Construction
Hendrick Mfg. Co.
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Stucco Facings
Crown Point Spar Co., Inc.
New York City.

Greenstone Products Co.
Roanoke, Va.

The Metro-Nite Co.
Milwaukee, Wis.

Switches and Frogs
Central Frog & Switch Co.
Cincinnati, Ohio.

Easton Car & Constr. Co.
Easton, Pa.

Tanks, Steel Storage
The Blaw-Knox Co.
Pittsburgh, Pa.

Pittsburgh-Des Moines Steel Co.
Pittsburgh, Pa.

The Stacey Bros. Gas Constr. Co.
Cincinnati, Ohio.

Testing Sieves and Testing Sieve Shakers
Tyler Co., The W. S.
Cleveland, Ohio.

Tramways
Interstate Equip. Co.
New York, N. Y.

Washers, Sand and Gravel
Link Belt Co.
Chicago, Ill.

Smith Eng. Works
Milwaukee, Wis.

Wheels, Axles and Journal Boxes
Easton Car & Constr. Co.
Easton, Pa.

Wire Rope
American Steel & Wire Co.
Chicago, Ill.

Leschen, A., & Sons Co.
St. Louis, Mo.

Wire Cloth
Cleveland Wire Cloth Co.
Cleveland, Ohio.

Tyler Co., The W. S.
Cleveland, Ohio.

Roads, buildings, bridges and all heavy concrete construction require washed and sized gravel and clean sharp sand.

To meet the strict specifications of engineers and architects, your plant should be equipped with the modern screening and washing equipment, which is built for this purpose.

S-A Equipped Plants Are Successful

Write for Section 5 Catalog

HANDLING THE BANK RUN

Steadily, continuously and in uniform quantities, the S-A Belt Conveyor delivers material to the screens. These conveyors are particularly desirable for this service. They are thoroughly reliable and require minimum attention.

If you contemplate building a new plant or if you anticipate changes or extensions to your present facilities—consult with S-A Engineers.

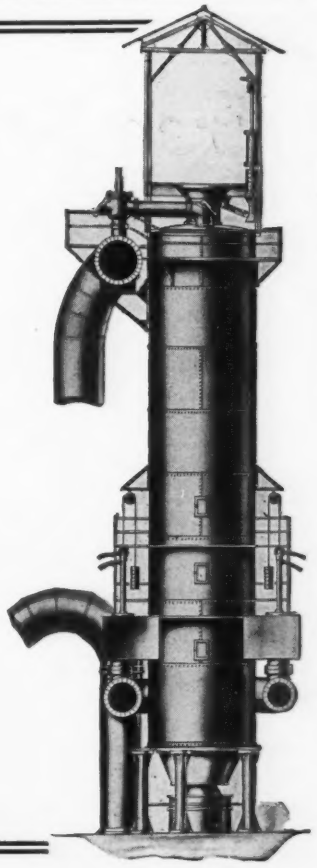
STEPHENS-ADAMSON MFG. CO., Aurora, Illinois

Continuous Discharge—Gas Fired

LIME KILNS

The wastefulness or efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



Glamorgan Pipe & Foundry Company

Lynchburg, Va., U. S. A.

Using the Nationally Famous Virginia Foundry Irons

Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

Poliet et Chausson Co., 129 Quaide Valmy, Paris, France, desire catalogs and information on the following equipment: bags, conveying and transmission belting, bins and bin gates, cableways, chain hoists, steel chain, conveying equipment of all kinds, sand and stone dryers, dust collecting systems, hoisting engines, lime hydrators, lime kilns, pyrometers and screens.

H. N. Dyke, Box 597, Imperial, Calif., wants catalogs and prices on marble sawing, cutting and polishing machinery.

B. S. Nomura, Hollywood Gardens, 5927 Hollywood Ave., Hollywood, Calif., writes us as follows: "We have just organized a stone works to be operated in Japan. We are at present in the market for tools and machinery."

A. E. Turner, George Hotel, Newcastle, S. Wales, Australia, desires quotations on calcining kettles for plaster of paris. He requires kettles 8 to 10 ft. diameter complete with stirrers.

Tara Chand Kirpa Dial, Ferozepur Cantt, Punjab, India, write us as follows: "Will you please have catalogs, prices, as well as complete information concerning the following items, sent us? Machines for grinding rock products into finest powder suitable for use in mineral paints; machines for crushing 10-in. and 12-in. diameter stones into 1½-in. to 2-in. ballast for roads; machines for crushing 2-in. or 3-in. ballast into ½-in. diameter, suitable for reinforced concrete cement work; machines suitable for grinding limestone into powder for agricultural purposes; machines for grinding glass sand and machines for making sand lime and earthen bricks of different sizes."

Karl A. Miller, Meadville, Pa., desires catalogs and information on all equipment necessary for operating a quarry, 200 tons per day output.

H. D. Conkey Co., Mendota, Ill., desire to purchase a second-hand steam shovel.

Colgan Limestone Products Co., 906 New Hayden Bldg., Columbus, O., are in the market for a second-hand "Hummer" screen, also a used box car loader.

INDEX TO ADVERTISEMENTS